RAILROAD GAZETTE

FRIDAY, MAY 20, 1904.

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Contributions

Tests for Rubber Wire-Insulation.

Washington, D. C., April 18, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The article on Rubber Insulation in your issue of March 18, conveys the impression that tests are of no value in determining the character or quality of a rubber covering for wire and that only the reputation of the manufacturer should be considered. It admits, however, that an insulation test is necessary, though why that one as well as the other requirements should not be left to the manufacturer is not made clear. It is admitted in the first sentence that to have about 30 per cent. pure para in the compound is desirable, still, the stretching test is characterized as absurd.

It is a well-known fact, or at least has been generally conceded so far, that any rubber compound containing a large proportion of new pure rubber makes a covering which will maintain a high insulation resistance much longer than a compound made chiefly of reclaimed rubber and adulterants. This being the case the desideratum is to find a method to readily determine the approximate amount of pure rubber in a compound. The chemical test being inaccurate and slow the stretching test is the only thing left, and it is an almost ideal method for practical use, as the amount of stretch and *set* of a rubber compound is a fairly exact index of the amount of pure rubber it contains. It also tells whether the rubber is well mixed and properly vulcanized.

No one has yet obtained a compound made of reclaimed rubber, rubber substitute and other adulterants which is capable of the same stretch and *set* that can be obtained on a compound made with a large proportion of pure rubber. At least, if such a compound has been made the secret of it has been well kept, and if it should be made there is the question whether it will meet the electrical tests.

The Master Car Builders' Association, realizing the difficulty of enforcing its demands that the rubber compounds used in making air-brake hose should contain a large percentage of rubber, adopted the stretching test as a part of the standard specifications for that material. That Association would certainly not have demanded a requirement which was so palpably absurd as you claim. Tests on samples cut from the inner tube of air-brake hose have shown that the rubber will stretch as high as seven or eight times its original length before breaking.

A set of specifications for rubber-covered wire prepared about three months ago in my office demanded a stretching test with a maximum set. The amount of pure rubber to be incorporated in the compound was not stated; it was merely specified that the compound should contain enough pure rubber to enable it to meet the tests.

There is not much difference of opinion as to the advisability of buying all material under fair and reasonable specifications. This, with proper inspection of the material, will insure the purchaser obtaining what is required and place all manufacturers on an equal footing. A recent purchase of a large quantity of wire under specifications will illustrate my point. Previous to sending out the specifications, whenever wire was to be purchased, nearly every wire manufacturer would quote prices and they would vary several dollars per thousand feet, each manufacturer claiming his wire to be as good as if not better than any other make. On the first lot of wire bought under the specifications, although the usual number of manufacturers were asked to bid, only five, and they were the ones with the best reputations for making high-grade wire, submitted figures, and the prices did not vary more than a dollar per thousand feet; and the wire met the tests. Truly, the proof of the pudding is the eating thereof.

S. D. C.

Alternating Current Signaling.*

The scheme of alternating current signaling was devised to meet the demands of high speed electric trains. Ordinary direct-current track circuits as applied to steam roads would not be satisfactory for this service because the running rails are here used as return conductors for the motor current. This current would wrongly affect the operation of the track relay, and of course the signal. To overcome this difficulty it was necessary to employ a current for the track circuit which would have such characteristic difference from that of direct-current as would operate selectively upon the track relay. Alternating current accomplishes this because of its ability to induce a current in another circuit brought within its magnetic field—a property not possessed by direct current. The track relay is, therefore, of the induction type, and responds to alternating current and not to direct current. An excess of direct-current cannot cause a wrong operation of the signal, other than to cause it to go to danger, for if a fuse or other protective device fails to open the circuit, the relay coils will be destroyed.

With this relay there is no such thing as residual magnetism, and the points of pick up and the release are identical, except as affected by twice the mechanical friction of the moving parts.

Two main feed wires bearing alternating current at, say, 60 cycles and 2,000 volts, extend the length of the system, and across these are connected the primaries of the track transformers, the secondary leads of which are connected across the rails at the exit end of each track circuit. Across the rails at the entering end are connected the terminals of the induction relay. We now have a circuit consisting of the secondary of the transformer, the rails and the coils of the track relay. Through this circuit passes simultaneously two kinds of current, alternating induced by the primary of the transformer, and direct, the return from the car motors.

Since the direct-current tends to make ineffective the alternating current, an impedance coil is connected across the relay terminals, or track rails; this has low ohmic resistance, but high inductive resistance or impedance to the passage of alternating current, and serves the purpose of shunting the direct-current from the relay, while compelling the alternating-current to pass through the relay.

It was my good fortune to be sent to California about one year ago to install the first alternating-current system of signaling. This was on the North Shore Railroad running north from San Francisco. The part signaled comprised about ten miles of double-track. This includes the rather novel arrangement of an old narrow gage railroad having added to its old steam service the new standard gage electric service. This was done by applying standard ties and the addition of one running rail. The rail which was common to both gages was divided into block sections. Thus trains of either gage, and whether propelled by steam or electricity, would operate the signals. Current for moving the electric trains, as well as for working the signal system, was generated at the famous Colgate power house, distant about 180 miles, in the Sierras, and with a water head equal to several Niagaras. The current was transmitted at about 40,000 volts at 60 cycles to the local power house near the tracks, and there transformed to 4,500 volts. For signal purposes we here connected to the neutral and one side of the three-phase system, giving about 2,300 volts single phase. At this voltage the electrical size of the wire required for the signal mains was less than that necessary for mechanical strength. In addition to supplying the track circuits, these mains served to supply current for lighting the signals and the way stations. The six-candle-power signal lights, in that clear atmosphere, gave, with properly focused lenses, an illumination which was very satisfactory. A novel feature, and one which appeals to the imagination, was that when making tests of the track circuits, we soon learned to tell when a storm was raging in the Sierras, by certain peculiar electrical disturbances, and we would forthwith postpone further tests until better weather prevailed in the mountains. Another feature odd to an Easterner is the fact that they can guarantee weather conditions in advance, so that during construction, cement and other material can be distributed and left entirely unprotected and yet be unharmed by the elements.

Some of the track circuits were about one mile in length, and as copious rains are frequent during the wet season, conditions were favorable for a test of the system. Ballast was of gravel and well removed from contact with the rails. We were happily surprised to find that under the worst conditions, the relays operated with a margin of about 30 to 40 per cent. or more, above the falling point. We had no failures due to the alternating current feature and since it was put into service, about eight months ago, we have not heard from the railroad company, so the signals are presumably working in a satisfactory manner.

An interesting feature was that of the effect of the alternating current in the tracks, upon animals. Although the voltage on the rails was about 8 to 14, horses soon refused to pass over the tracks at road crossings, and things came to such a pass that something had to be done. The simple remedy was that of insulating the block rail at crossings and connecting over by a wire run through the road in grooved lumber.

The signals used were of the Union Style "B" electric semaphore type operated by eight-volt storage batteries, two sets of which were set in the base of the signals. Where two signals were opposite each other, one set served for both. They were charged at a rate of, $\frac{1}{5}$ ampere, through resistance, from the 500-volt contact rail. Thus no primary batteries were necessary, the chances of failure were reduced and the cost of maintenance also reduced to a minimum.

During certain hours of the night the electric train service was shut down, while the steam service continued. Storage batteries thus kept the signals alive while the contact rail was dead.

Alternating current for signaling purposes opens up a field which is in some respects revolutionary. The point of chief interest, aside from that of immunity from the effects of direct-current, whether that of electric roads, or that of foreign currents on steam roads, is that of transmission. Its advantages and possibilities in this respect are very great.

*A paper read before the Railway Signal Association at New York, May 10, by J. B. Struble, of the Union Switch & Signal Co.

A Superintendent's Staff Meeting.*

To the General Superintendent:

Staff meeting called 11 a.m. in office of Superintendent: Present, Master Mechanic, Road Foreman of Engines, Trainmaster, Assistant Trainmaster, Division Engineer, Captain of Police and Superintendent.

SUBJECTS DISCUSSED.

Ash-pans on Engines.—Ash-pan slides are tied open and pans are warped. This is a result of not wasting sufficient water in ash-pans. Discussed by General Foreman and Road Foreman of Engines. They say that many of our ash-pans are in bad condition, worn out and have holes in them. Dampers have been fastened down and levers taken off to prevent same being opened. The subject will be further investigated and taken up personally with enginemen and firemen.

Fires.—Division Engineer reported an unusual number of fires on right of way in the past week. General Foreman said netting of stacks of engines was examined upon arrival of engines on all trips and record of same made; they have been reported in good condition.

Double Crewing Freight Engines.—Discussed by trainmaster, road foreman of engines and general foreman. It seems to be the consensus of opinion that owing to the fluctuation of business it is not practicable to put this in operation until business becomes more settled and engines are running more regularly. The average mileage of through freight engines last month being 3,854 would not be sufficient to divide between two crews.

Condition of Track in Yards.—Discussed by division engineer, trainmaster and assistant trainmaster, particularly with reference to numerous derailments that have occurred. Division Engineer expressed opinion that many such derailments were in part due to running through switches. Where flying switches are made, poor judgment is used. It was recommended that a form of switch or switch rod be adopted by which the switch would not be injured if run through. The condition of track in the X. Y. yard, however, is very bad and at present in very soft condition with bad rails, bad frogs and very bad drainage. This condition can and will be improved by cleaning up track, removing the mud, and replacing same with dry cinder. Leads to switches will be renewed with better quality rail; will also need to renew about 50 per cent. of the ties at both ends of the yard.

Condition of Main Track.—Discussed by Division Engineer and Road Foreman of Engines. Track has much improved in the last 30 days, particular attention being given to line and surface and getting track in good condition before renewal of ties.

Glass Broken.—Division Engineer reported unusual number of switch lamps broken at [city terminal yards]. Captain of Police says that on account of reduction of force he has not been able to give the same close attention to this as in the past, but would investigate.

Spring Work.—Question of providing necessary power and equipment for work trains discussed by all present. All arrangements had been made for the handling of our regular season's supply of ballast promptly, as provided, commencing April 1.

Train Service.—Question of eliminating the numerous delays which have occurred discussed by all present. We are still short of power for through express trains, and there is not enough time at either end of road to properly care for engines and get them out in time for their runs.

Meeting adjourned at 1 o'clock.

*Report of semi-monthly meeting on a division of one of the Trunk Lines.

Passenger Stations of the Illinois Central.

In showing the accompanying photographs of 15 stations and station interiors on the lines of the Illinois Central, practically all of the most characteristic types in use on that railroad are included. There is the two-story frame house as commonly seen along the Yazoo & Mississippi Valley, and there is the unique Van Buren street suburban passenger station at Chicago, representing a very high development of the art of making a practical, handsome, and commodious station perfectly adapted to the situation in which it had to be built. It will be noticed that the prevailing type of construction is brick. The usual price of brick per thousand on the Illinois Central for outside work is $4.50, and of pressed brick for inside work $16.50. The usual price in Illinois for different soft wood lumber used in station work is $20 per 1,000 ft., and the cost of brick stations is estimated at one-third more than that of a frame station of the same general character; but, on the other hand, the cost of maintaining frame stations comes to about one-half more than the cost of maintaining brick stations. Station plans are made by the company's own architect, and the smaller stations on the line are built by the company's forces.

The two-story southern house (Fig. 1) representing the type of station situated at isolated points in farming districts, contains separate waiting rooms for white and colored passengers, a ticket office and a freight room, on women's waiting rooms, ticket office, toilet arrangements, and facilities for the American Express Company. As shown in the illustration, there is a separate baggage and lunch room building in connection with the station. The station at Champaign, Ill. (Fig. 4), is of this same general type, but has the baggage and lunch room under the same roof with the main station. It furnishes a good example of the type of brick station, used at towns of moderate size on the northern lines of the Illinois Central.

The Kankakee station (Fig. 5) is a somewhat more

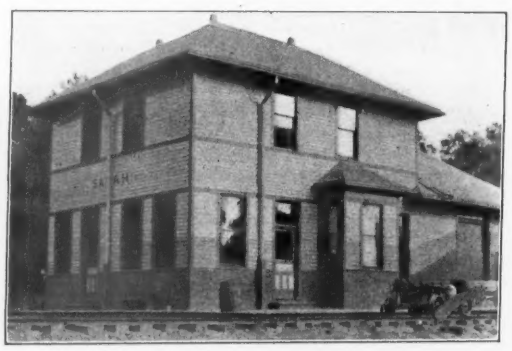


Fig. 1.—Small Towns in the South.

At Carbondale, Ill., on the cut-off from the main line to Paducah, Ky., there is a good example of a type of station (shown in Fig. 7) which provides quarters for the United States mail service. Here there are two offices for mail clerks and a mail room, in addition to the usual station arrangements. As at Waterloo, a separate lunch room is maintained. The station at Denison, Iowa, (Fig. 8) is a typical one-story brick station, well balanced, with the men's waiting room on one end and the women's on the other, connected by a passage between the ticket office and toilet room. The baggage room is at one end of the structure and the express office is at the other end. On the outside of stations of this general kind, a device has sometimes been adopted, as at Rockford, Ill., of using for a height of four or five feet from the ground, a type of fancy brick so rough that it is impossible to write on it, so that it restrains the literary and artistic inspirations of passengers and other frequenters of the station.

The station at Springfield, Ill., (Fig. 9) is a notable instance of careful detail and finished work in a large and pretentious station. There are two ticket offices placed on opposite sides of a passage between the men's and women's waiting rooms. One of these waiting rooms is shown separately in the accompanying illustration (Fig. 10), and is seen to be prettily decorated with an overhanging balcony. A driveway extends around the rear of the building, the entrances on this side being in conjunction with porte cocheres. The upper part of the

Fig. 2.—Station at Fulton, Ky.

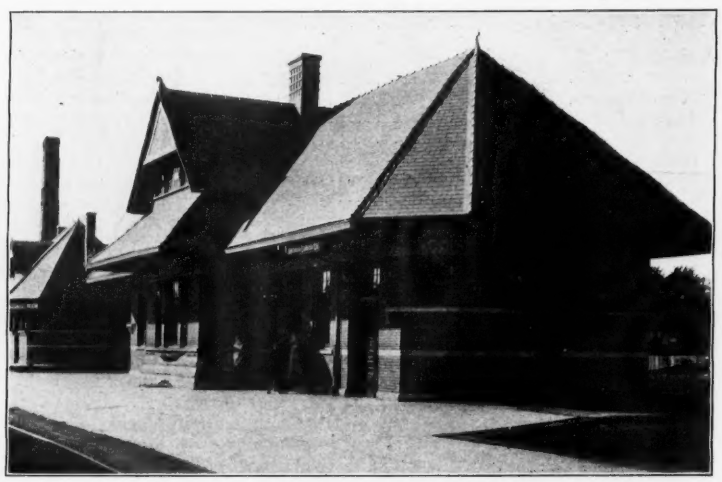


Fig. 3.—Waterloo, Iowa.

Fig. 4.—Champaign, Ill.

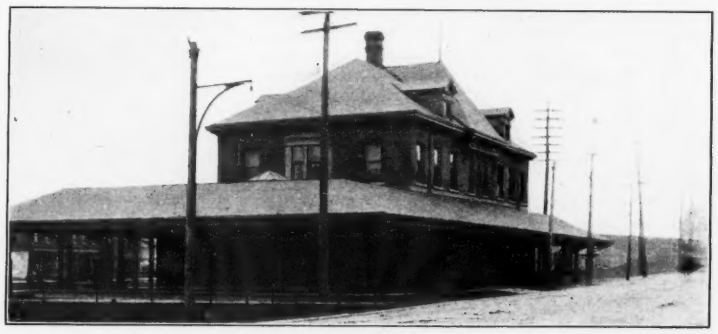


Fig. 5.—Kankakee, Ill.

Fig. 6.—Clinton, Ill.

Fig. 7.—Carbondale, Ill.

the ground floor. The upper part of the house is occupied by the agent's family, and contains from three to five rooms. Fig. 2 is also a frame station, of a considerably more pretentious type. The one shown is located at Fulton, Ky., which is the half way point between Chicago and New Orleans, and is also the junction of the main line, the Yazoo & Mississippi Valley, and the line to Princeton and Louisville. The ground floor of the Fulton station has waiting rooms for white and colored passengers, a ticket office, smoking room, and United States mail and baggage rooms. The second story portion over the ticket office, resembling somewhat an operator's tower, contains despatchers' and road supervisors' offices.

Fig. 3 shows a neat and trim style of station considerably used on the western lines. It is located at Waterloo, Iowa, which is a junction point for the branch to Albert Lea, Minn. This station contains men's and pretentious structure with a separate protection for the platforms, instead of provision for this being made by extension of the roof, as with the former stations. The station at Kankakee has the men's and women's waiting rooms, ticket office, baggage and express rooms on the first floor, and the second floor contains offices for the division headquarters. Clinton, Ill. (Fig. 6), is a thoroughly practical solution of a combination passenger station and office building. It is a brick structure three stories high, and in addition to the usual station arrangements, including a lunch room on the ground floor, the upper portion of the building provides ample accommodations for the superintendent, roadmaster, chief despatcher, trainmasters, and supervisors. It also has large telegraph offices and complete toilet arrangements. Clinton is the junction point of the old line from Freeport to Centralia with the main line to St. Louis, and the branch across from Champaign to Havana, Ill.

building is divided up into quarters for the use of division officers.

At Decatur, Ill., (Fig. 11) the architect has departed quite radically from any standard or set style, but has developed an extremely pleasing structure worked out on Gothic lines. The station is built of pressed brick, stone trimmed, and has a red tile roof. The Decatur station contains a lunch room and kitchen, while the express and mail buildings are separated from the main structure, but connected by a covered platform. It will be noticed however, that no effort has been made to protect from rain passengers standing on the main platform. The station at Council Bluffs, Iowa, (Fig. 12) is the first one shown where use is made of an umbrella shed. The station is a very pleasing and modern structure, differing somewhat architecturally from those hitherto shown. It is built of buff pressed brick, trimmed with stone, and the main waiting room has large brick fireplaces. This

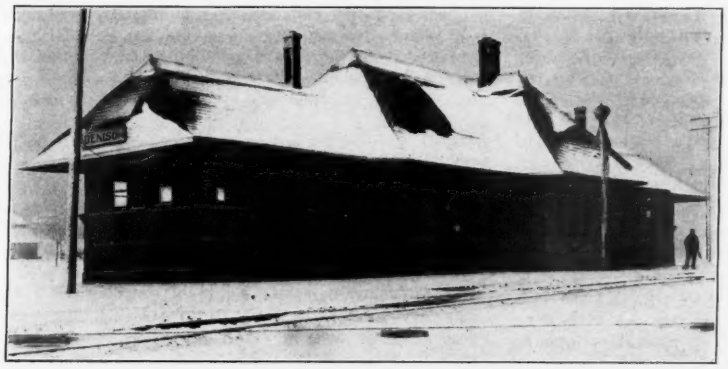


Fig. 8.—Denison, Iowa.

Fig. 9.—Springfield, Ill.

Fig. 10.—Men's Waiting Room, Springfield, Ill.

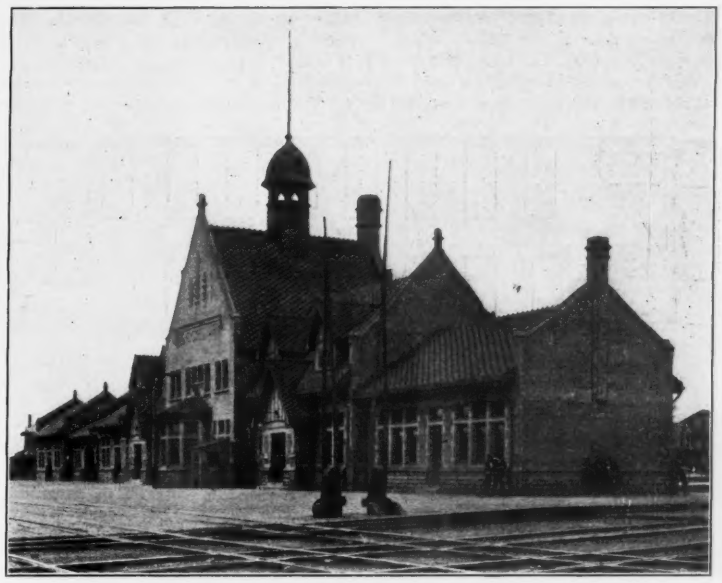


Fig. 11.—Decatur, Ill.

Fig. 12.—Council Bluffs, Iowa.

Fig. 13.—Van Buren St. Suburban Station, Chicago.

Fig. 14.—Local Suburban Waiting Room, Van Buren St. Station.

Fig. 15.—Central Station at Chicago.

waiting room is two stories high, broken at the second floor by a balcony. The one-story wings on either end are well placed, the grouping is good, and the station is at once complete and trim looking.

The Van Buren street suburban station, at Chicago, the exterior and an interior view of which are shown in Figs. 13 and 14, is a unique structure, entirely concealed under the Lake Front Park, at Chicago; but the ventilation and light is perfect, and the station is cool in summer and warm in the winter. A series of matron, toilet, smoking and women's reception rooms, janitor's closet, and ticket offices open upon two waiting rooms, each 34 ft. x 106 ft. The interior is finished in mahogany, with tile floors and walls, while the outside presents a stone front of modern Gothic, with an artistic bridge over the tracks. The basement contains gas fuel heating boilers and electric lighting apparatus. The last illustration (Fig. 15) shows, from the lake side, the Central station at Chicago, which has recently been enlarged by the erection of an annex office building, facing Twelfth street. This office building is of fireproof steel construction, employing the Roebling system of concrete floors on expanded metal. The exterior is built of pressed brick and terra cotta, and in design conforms to the character and details of the architecture and general plan of the old structure, which has been fully described in previous issues of the *Railroad Gazette*.

Compressed Air and Pneumatic Tools in Railroad Service.*

To the railroads must be given the credit for the development of air tools in the metal trades, as it was the air-brake pump, always available as a source of power supply, that gave the initiative for this development of pneumatic tools in the railroad shops; but the air-brake pump as a stationary source of compressed air supply has long since outlived its usefulness, and it is a humble shop indeed which does not now possess a modern compressor. It is gratifying to note the improvements effected in the design and construction of air-compressing machinery within the past five years, directly affecting, as it does, the cost of performing the operations for which air tools are employed; and to a certain extent the rapid increase in the use of air tools may be traced to the economies effected in transforming steam or electric power into compressed air.

The pneumatic hammer is, of course, the most widely used and best known pneumatic appliance in shop service, employed for chipping, calking, beading flues and riveting. It averages 10 to 13 lbs. in weight and operates at a speed of 1,100 to 2,000 blows per minute. One man with a pneumatic hammer, in chipping, etc., will do as much as three to four men working by hand. A ⅜ in. chip has been removed by one of these hammers from a boiler plate ½ in. thick at the rate of 7 in. in 48 seconds. Among special uses for the hammer of particular interest to railroads are driving spikes, and removing scale from locomotive crown sheets. For spike-driving the ordinary long stroke riveting hammer held by the hand is provided, with a set suited to the spike head; but for the removal of scale from crown sheets the hammer is adjusted between grate and crown sheet by means of a pipe extension.

The riveting hammer has been the outcome of the chipping hammer, made with a larger diameter cylinder and a larger stroke. Riveting hammers are now used on all boiler work, tank work, metal cars, bridges, etc. The air drill, or reamer, next to the hammer, is the most widely known pneumatic appliance, and has an extensive range of utility. Among special uses for the drill motor is its adaptation as a casting cleaner, portable emery wheel, polisher, driving cylinder boring-bars, valve facing machines, motor hoists, operating turntables, jib cranes and elevators. In the car shops the pneumatic drill, running at a higher speed than the one used on metal, and weighing from 10 to 25 lbs., will bore a 2½ in. hole through 5 in. of oak in less than 20 seconds. In the foundry compressed air is used for chipping and cleaning castings, operating hoists, elevators, casting breakers, sand blasts, moulding machines, sand sifters, sand rammers, etc.

In the railroad yard compressed air is used for cleaning seats, cushions, curtains and bedding and for testing air-brake equipment. The time is not far distant when all roads will be equipped with a small compressor plant at junction points for the purpose of testing air-brake equipment on cars received from foreign roads before resuming their journey.

Pneumatic tools must receive proper care and lubrication in order to give proper results, therefore one of the most important factors connected with their care is to keep them clean and well lubricated. A good plan is to clean by using benzine freely through the throttle handle. This dislodges all foreign matter and cuts the thick oil which can then be removed by blowing the air through the throttle. It is an excellent plan to submerge the tools occasionally over night in a bath of kerosene and then blow out under pressure the following morning, and lubricating with a good quality of light machine oil. Proper efficiency can only be obtained by selecting tools of suitable weight and capacity for each class of work.

The following uses and savings are given by a superintendent of motive power of one of the large western railroads:

Putting wheels in wheel lathe, three lathes in the shop, an average of one change a day, save one man in handling this work. Hoisting steel-tired wheels and axles in lathe, average of six changes a day, save one hour in time and one man less to handle the work. Hoisting axles into cut-off lathe, an average of ten changes a day, save one hour per day in time. One large boring mill averages two changes a day, saving of time of 30 minutes and the use of one helper. Handling cylinders in large boring mill and planer, save the labor of one man and one-half hour each change. Three men working on pistons, etc., in raising them from the floor to the bench, serving three machinists, save one helper five hours per day. Raising chucks, face plates and other heavy work, air hoists in the machine shop save one helper one day. Lifting driving wheels and other heavy work on the large slotting machine, saves the time of one man and 20 minutes. In applying cylinders on boilers saves one machinist and helper's time of 10 hours. Facing valves, saves helper's time of four hours. Pressing on driving wheels and axles, etc., three less helpers one hour each. Boring cylinders, three helpers' time four hours. Applying driving brakes to old engines, drilling holes, reaming, etc., saving 15 hours of time of machinist and helper. Pneumatic tin and galvanized iron press, in getting out stock for 20 dozen water buckets, get it out in eight hours where it previously took 40 hours. In making brake shoes, stamping a loup to have a casting run on, previously one man would do 200 in a day where he now does 600. All work on this machine saves in the neighborhood of from 50 to 60 per cent. Running foundry elevator with the air hoist saves 25 per cent. of one man's time. Save 75 per cent. time putting in stay-bolts in a fire-box by using air motor for tapping out holes and screwing in bolts. Save about 50 per cent. in using pneumatic hammer for calking both flues and boilers. Blowing out engines with air, saves a cord of wood, besides the inconvenience and delay, as the men cannot work around a hot engine to advantage. Handle all engines on the transfer table now run by air, previously run by crank. One man does now what six did before. Pneumatic hoist for unloading scrap at the foundry—the old method took six men 10 hours; under the same conditions, with the hoist, two men will do it in four hours. Unloading a car of wheels took six men half an hour; now three men will do it in 15 minutes. Sandpapering a 50-foot baggage car by hand took about 60 hours; now it takes 14 hours with the sandpapering machine. Air jacks for raising and lowering freight cars now take one man three minutes, where previously it took two men ten minutes. Truck jacks, to remove three pairs of wheels, takes 1½ hours; the old method took six hours. Air whitewashing machine—it formerly took ten men five days; now it takes four men one day.

The question of primary importance in the installation of pneumatic tools is to determine the type of compressor, whether to drive it by direct steam or by belt power, electricity, or water power. Of course water power presents the ideal condition, but for this we must depend upon nature. In many places electricity is preferable where a large power plant generates electricity at a very low cost, but in most cases it is more desirable to have a direct steam-driven compressor that may be operated overtime, without running the rest of the power plant. If electricity is the motive power the question would arise whether it would be most desirable to gear the compressor, or have it direct connected or drive it by belt power. There are arguments in favor of all these different forms of installation, dependent naturally upon the individual conditions presented. Belt power is not always desirable because of the unusual strains that will come upon the air compressor shafting and belts, because an air compressor is not an even running machine. This unevenness of operation is obviated in a duplex compressor, with cranks at right angles, one side helping the other. Furthermore, the duplex type of construction presents the advantage of an auxiliary machine, as one side of the compressor may be cut out and operated independently of the other. There is a strong advantage in compound compression in the larger sizes, providing sufficient attention is paid to adequate inter-cooling.

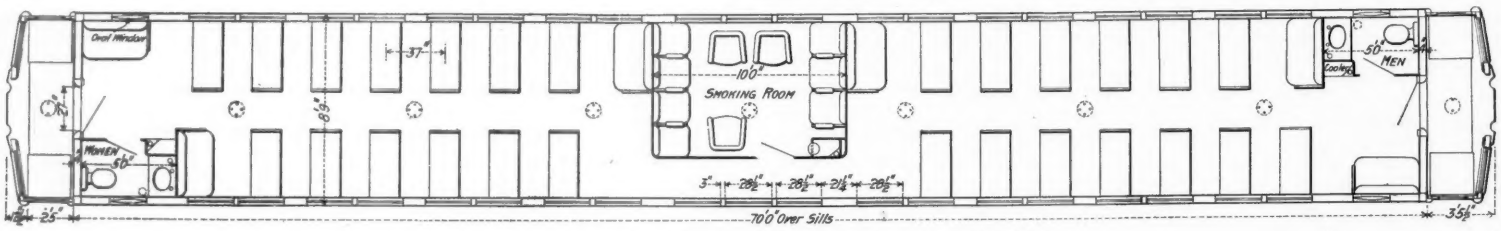
The greatest trouble that has been experienced heretofore in compressor installations is the tendency to install compressors of too limited capacity. The best plan is to estimate the full use for air and then double it. Another point that must not be overlooked in the selection of air equipment is not to be guided too strongly by first cost. Consider all these features and estimate the power cost per cubic foot of free air per minute delivered under your required pressure; make a thorough calculation as compared to first cost, and eventually you will find that the difference between the cheap compressor and the good one will earn a handsome interest on an investment basis.

It is essential that the receiver capacity shall be liberal. Receivers are not expensive, and the greater receiver capacity provided the greater percentage of moisture is eliminated from the compressed air. Receivers are not valuable primarily for storage service, the main purpose being to eliminate pulsations from the air and collect moisture. Separate receivers are recommended in large plants at the chief points of consumption. Frequent tests should be made to determine tightness and locate leaks in air lines. Air pipe lines should be adequate in size to permit discharge of compressed air without appreciable loss of pressure through friction. Cooling of the compressed air after compression, or after cooling, as it is termed, is desirable and reheating the air also increases efficiency.

*Abstract of a paper by Mr. Thos. Aldcorn presented to the Central Railway Club, May 13, 1904.

New Day Coaches for the Erie.

The Erie has lately put in service some new day coaches which contain an innovation in interior arrangement. A floor plan is shown herewith, from which it is seen that the smoking room is placed in the center of the car, dividing it into two compartments. This room is 10 ft. long and contains seven stationary and three movable seats. An interior view of the car, looking toward the smoking room, which is shown, gives a good idea of the interior finish of the car. Each of the three partition walls of the smoking room contains an ornamental window, 30 in. x 40 in., composed of plate glass set in a hard metal framework. In addition to aiding in making lighter the interior of the smoking room, these ornamental windows relieve the blank effect the exterior of these walls would present without them.



Plan of Erie Coach with Smoking Compartment in the Center.

The cars are 70 ft. over end sills, are mounted on six-wheel trucks and have seats for 64 persons outside of the smoking room. Ten were bought, some being used in the World's Fair service and others between Chicago and New York. The Barney & Smith Company was the builder.

Erie Coach with Smoking Compartment.

The Michigan Central Fast Run of April 27.

A very fast run of a special train over the Michigan Central from Niagara Falls, Ont., to Chicago, Ill., was reported in the *Railroad Gazette* of May 6, page 351. An officer of the road gives additional particulars, by the aid of which we are able to make up the following memoranda of distances and speeds.

Niagara Falls to Windsor, 225.66 miles at 68.38 m.p.h., including one stop of 6 min. 30 sec. (at St. Thomas); Niagara Falls to St. Thomas, 115 miles at 71.1 m.p.h.; St. Thomas to Windsor, 111 miles at 70.5 m.p.h.; Shedden to Essex, 86.28 miles at 78.53 m.p.h. The train with which this run was made consisted of an engine, tender, baggage car and three passenger cars. East of Detroit

the weight of the cars was 334,900 lbs.; at Detroit the baggage cars were changed and for the rest of the journey the weight of the cars was 343,100 lbs. The locomotives were of the Atlantic type, Class K. These engines weigh 176,000 lbs., and the tender loaded weighs 125,000. This type of engine is similar to the Class I, "Central Atlantic," of the New York Central; cylinders 21 in. x 26 in., weight on drivers 95,000 lbs., diameter of drivers 79 in., heating surface 3,505 sq. ft.

In an account which has been published in the newspapers it is stated that a rate of 104 miles an hour was made in one place; 105.6 miles at another, and 111.9 at another; but as these were short distances and the times were taken from the train sheet, on which seconds were not recorded, these remarkable figures can hardly be called sufficiently accurate to be classed as records. The data from which these high rates are deduced are as follows: Brownsville, Ont., to Springfield, 5.2 miles, 3 min.; Bismarck, Ont., to Rodney, 4.4 miles, 2½ min.; Crisman, Ind., to Lake, 3.73 miles, 2 min.

The best previous record that we find for so great a distance as 225 miles is that of the Twentieth Century Limited, on the Lake Shore & Michigan Southern, May 25, 1903, Cleveland to Elkhart, 241.4 miles, at 66.12 miles an hour. The best for 115 miles is that of the same train, Toledo to Elkhart, 133.4 miles at 70.2 m.p.h.; and the best for 86 miles is that of the special on the same road Oct. 24, 1895, Erie to Buffalo, at 72.91 m.p.h.

The Air-Brake Convention.

The Air Brake Association held its eleventh annual convention in the Niagara Hotel, Buffalo, N. Y., May 10, 11 and 12. The attendance was the largest the association has yet had, there being about 175 members present. The Secretary reported a membership of 726, and a balance in the treasury of $1,443. The officers for the ensuing year are: President, John Hume, Jr., H. & T. C. R. R.; First Vice-President, L. M. Carlton, C. & N. W. R. R.; Second Vice-President, W. P. Garabrant, P. R. R.; Third Vice-President, T. L. Burton, C. R. R. of N. J.; Secretary, F. M. Nellis, *Locomotive Engineering* (re-elected); Treasurer, Otto Best, N. C. & St. L. (re-elected); Member Executive Committee, J. R. Alexander, P. R. R.

During its sessions the convention was addressed by Messrs. J. F. Deems, General Superintendent of Motive Power of the New York Central Lines; W. O. Thompson, Division Superintendent of Motive Power of the New York Central; F. W. Brazier, Assistant Superintendent of Rolling Stock of the New York Central and President of the Master Car Builders' Association; Angus Sinclair, of *Locomotive Engineering;* and George Groobey, Inspector for the Interstate Commerce Commission.

President E. G. Desoe (Boston & Albany) in his address, after reviewing the history of the association and dwelling on the importance of the work, referred to the safety appliance law on power brakes, quoting those parts providing that a sufficient number of cars in a train must be so equipped that the engineman can control its speed, and that this "sufficient number" shall be not less than 50 per cent. of the cars in the train; and that all power-braked cars in such train which are associated together with said 50 per cent. shall have their brakes so used and operated. He then assumed a case of a train of 50 air-braked cars, the brakes on the twenty-sixth car of which were inoperative from a broken train pipe, cutting out, of course, all cars back of it. He asserted that, although 50 per cent. of the cars would still be air-braked, this condition would be a violation of the law; but if the twenty-sixth car were not equipped with power brakes the conditions would be in compliance with the provisions of the law. The point had been submitted to Secretary Moseley, of the Interstate Commerce Commission, who said that, looking strictly to the letter of the law, the interpretation was probably correct; but that it was the spirit of the law rather than the letter that they desired railroads to regard, the object of the Commission in specifying not less than 50 per cent. being to invest "sufficient" with a definite minimum value.

The President pronounced the high-speed brake tests on the Central Railroad of New Jersey as the principal occurrence of interest to air-brake men during the year, and referred to the remarkable fact they developed, that with good rail conditions trains could be stopped without serious wheel sliding and have a terminal braking power of 115 per cent. Also, in emphasizing the value and importance of the pressure retaining valve, he referred to, and quoted from, the paper on this subject by Mr. F. H. Parke, printed in the *Railroad Gazette*, January 29, 1904.

In concluding he made a number of recommendations, seven in all, which included revision of the constitution and by-laws; the provision of a standing committee to attend the M. C. B. conventions to convey recommendations from the Air Brake Association, give any information desired regarding its attitude on matters concerning it, and obtain and report to its association full information on all matters pertaining to air brakes or steam heating of trains acted on by the M. C. B. Association; the inclusion in each year's Proceedings of an index of all subjects discussed by the association to date; the revision of the association's air-brake catechism; the adoption of the policy of having recommended practice; and the consideration of the advisability of applying brake-shoe pressure to each pair of wheels under a car equal to the light weight transmitted by them to the rail, less the amount of weight necessary to prevent skidding of the wheels, instead of the present plan based on a percentage of the total light weight of car.

The first report considered was "Handling Passenger Trains with Back-Up Hose," the committee's recommendations being taken up seriatim. In the first one, the clause providing for two trainmen of one or two years' experience on the back platform occasioned considerable discussion, some members being of the opinion that one trainman is enough. Mr. Carlton, the chairman of the committee, suggested that safety, the coroner's jury and the claim department must all be considered in this matter and that a second man is a provision on the side of safety, there always being a possibility of one man being disabled; the suggested arrangement being one man of experience and one learning. The clause above quoted was finally amended to read "and one or more trainmen of experience," making optional the provision of more than one man, and eliminating the specification covering term of experience.

The fifth recommendation, on motion of Mr. T. L. Burton (C. R. R. of N. J.) was amended to read: That a terminal or road test of the brakes be made from the locomotive on trains to be backed from the yards, and afterward from the back-up hose by signaling to the engineer and then making application; the engineer to observe if a reduction is made as indicated by the black hand on the air gage, and when such a reduction is made, signal to the rear end. That the standard code of signals of the road in question be used. That only the back-up hose test as described be made on trains to be backed from terminals when the make-up of the train has not been changed at the terminal.

No. 6 was amended by the addition of the clause, "with the back-up hose," the paragraph to read: A running test should be made with the back-up hose, the initial application being about 200 ft., etc.

In regard to No. 7, Mr. Burton pointed out that it contained no provision for holding a train backing down a grade. His motion to amend as follows was adopted: That the handle of the engineer's brake valve be carried in running position, and not placed on lap to assist in making an application from the back-up hose. Following either a slow-down or stop, when signal is given to continue backing, that the handle be moved to full release as in making a regular brake release. On grades where a train will not stand with brake released, that it be held by straight-air brake on engine and tender, or in the absence of such a brake, by admitting steam to the cylinders with engine reversed. That the engineer apply the automatic brake in the absence of a sufficient application from the back-up hose whenever it is required to insure the safety of the train.

Mr. Desoe (B. & A.) said that since the automatic brake cannot be depended on to hold a train on a grade, some other means for stopping should be provided. Straight-air alone will hold heavy trains on pretty stiff grades, being much more efficient than the locomotive reversed and working steam, although the latter is far preferable to relying on the automatic brake alone.

The ninth recommendation a number of members were in favor of omitting altogether. Mr. S. D. Hutchins (W. A. B. Co.) cited, as an instance of where this recommendation could not be observed, the Cincinnati station, as a considerable grade there would make it unwise to stop within 15 ft. of the bumping post because of the difficulty of starting again. Mr. Desoe cited the large number of train movements at the South Terminal, Boston (4,000 yard movements a day, of which 840 to 870 are regular trains), and said the good results there were due in large part to the practice of stopping in accordance with the rule embodied in the recommendation.

The practice of making a preliminary stop as suggested in the recommendation was tried on the Michigan Central, particularly at the Detroit ferry and station, and was abandoned. Smooth stops and starts are rarely made, the usual result being more or less jerky, and consequently annoying to the passengers. Their practice is to slow down to very low rate of speed for couplings, and to stop slightly short of the point for bumping posts. An objection urged in connection with suburban service was the probability of passengers attempting to board the train when the preliminary stop was made, and consequent likelihood of accidents. After some further discussion, in which it was stated that men were pretty sure to hit too hard or else stop short of the desired point if no preliminary stop was made, a motion to amend by inserting the words, "where the local conditions permit," was adopted. The recommendations as a whole, as amended, were then adopted.

The paper on "Standard Length of Brake Beams, Suspension of the Same, and Foundation of Brakes," by T. A. Hedendahl (W. A. B. Co.), was next considered. Mr. Down (W. A. B. Co) thought that the foundation brake gear should be so arranged that the slack can be adjusted either for the automatic or hand brakes, by the slack adjuster or otherwise Mr. Burton thought that if the brake beam were shortened to the length recommended in the paper there would be danger of the shoe crowding in the flange throat unless made to conform to it; his idea being a 60-in. beam with an allowable variation of ⅛ in. either way. He thought the best solution for the difficulty of inability to keep shoes on wheel treads would be a flanged brake shoe, where it can be used. He did not approve of the suggestion, for inside-hung brakes, that the center line of brake hangers be made 90 deg. from a line through center of brake shoe and center of wheel when shoe is half worn out. The Jersey Central is changing the hangers on some of its passenger equipment from an angle of 9 deg. with the vertical, to 20 deg., the beams being suspended with their center lines 3½ in. below the center lines of the journals.

Reference to the need of sufficient angularity of hanger to cause the brake shoes to drop free of the wheel treads upon release, brought out a statement from Mr. Carlton (C. & N. W.) that some dynamometer tests on his road disclosed the fact that it required 9 per cent. more power to move the test train when no heed was given to the shoes after release, than when every shoe that so required was pried free of the wheel tread. He stated that the length of hanger should not be less than 8½ in. Mr. Burton thought they should be as long as conditions would permit.

Referring to the statement in his paper that all beams should be capable of enduring the M. C. B. test of 15,000 lbs., Mr. Hedendahl said that some recent tests showed that the pressure from the air brakes alone to stop a train on a 4 per cent. grade exceeded 11,000 lbs. per beam. Mr. Stricklan (D. M. & N.) said that brake beams designed to meet present-day conditions are supposed to be able to withstand a pressure in the train line of 110 lbs., but that under the heavy pressure the shoes spread outwardly and overlap the wheel tread as much as ¾ in. Mr. F. B. Farmer (W. A. B. Co.) thought the connection of brake head to beam was a feature needing careful attention. It was decided to have a committee prepare the recommendations of the association on the matter, which will be presented to the next meeting of the M. C. B. Association by a committee from the Air Brake Association.

In considering Mr. J. P. Kelly's paper on "Higher Train-Pipe Pressure for Passenger Service," the author pointed out the two principal features he had endeavored to bring out—(1) the desirability of increasing the train-pipe pressure from 70 lbs. to 90 lbs. in all cases where the foundation gear is sufficiently strong to permit it, and (2) the suggestion that in emergency applications from 110 lbs. train-line pressure there be no blowing down of the brake-cylinder pressure. In reference to the first he stated that it would shorten by 250 ft. the stop from 50 m. p. h., the only action needed being to screw down the pump governor. Replying to a question, he said this increase might also be extended to freight equipment with advantage.

Mr. Parker (G. N.) having asked if a light locomotive having 90 or 110 lbs. train-pipe pressure, with a main reservoir capacity of 50,000 cu. in., would not be likely to slide its wheels, Mr. Kelly stated that there was always that possibility, no matter what the train-pipe pressure. An advantage of the higher pressure would be quicker stopping and, therefore, less sliding.

The Jersey Central, Mr. Burton said, had been using 90 lbs. in the train line for over two years, and they had not had over two pairs of slid-flat wheels. Other members reported similar practice on their roads, with no bad results. Mr. Foster (N. Y. C.) related an instance occurring on his road where they had had some high-speed trains running with 135 lbs. train-pipe pressure, resulting from an inaccurate test gage by which the air gages had been calibrated. Also at the same time they had 14 cars running for three weeks with the high-speed reducing valve inoperative. There were no bad results in either case.

Several members were of the opinion that the adoption of the recommendation would mean a considerable increase of slid-flat wheels, citing experiences to bear out their claims. Mr. Nellis thought that it depended as much on how the brake is handled by the engineman as on the pressure, whether or not there would be slid-flat wheels, relating an instance coming under his observation where a street car using a storage system with 300 lbs. in the reservoir and reducing two valves to train-line pressure, had both valves become inoperative and the braking was therefore done direct from the reservoir. The gage had also been injured, so the motorman was obliged to brake entirely by touch, yet the wheels were not slid once, although these conditions continued throughout an entire winter.

Mr. F. B. Farmer having pointed out that the recommendation was a broad one and often local conditions would make it inapplicable, Mr. Burton moved that 90 lbs. train-pipe pressure be substituted for 70 lbs. wherever the local conditions are such as to make it practicable. Mr. Foster amended the motion to include freight equipment, and the amended motion was adopted.

Coming to the second feature of the paper, Mr. Rice (Grand Trunk) reported some high-speed tests with a 98-ton engine and five cars, stopping by emergency application from 70 m. p. h. in 1,340 ft. without sliding of wheels, the reducing valve being in operation. Mr. Burton suggested that if it was desired to increase the retarding force that it might better be done by increasing the initial pressure rather than by omitting the reducing valve; that if it is practicable to raise the terminal brake-cylinder pressure it should be equally practicable to increase the initial pressure.

In connection with the discussion Mr. Nellis read a paper advocating basing the braking power of passenger cars on the dead weight carried per axle instead of on 90 per cent. of the weight of the car. An abstract of this paper is printed in another column. Mr. Nellis asked the members to give particular attention during the next year to this matter of uniform and higher braking power. Mr. Hedendahl said that for over a year the Denver & Rio Grande has had its passenger equipment

braked on the basis outlined in Mr. Nellis' paper, with highly satisfactory results.

A paper by Mr. R. H. Blackall (W. A. B. Co.) on "The Friction of Brake Shoes" was, in the absence of the author and at the request of the President, presented in abstract by Mr. F. W. Sargent. There was no discussion of this paper nor of the one following, which dealt with the selection of subjects, committee work and the presentation of papers, by Mr. F. M. Nellis. In connection with the latter, however, it was suggested by Mr. F. B. Farmer that all committee reports and papers sum up, in the form of recommendations, the points it is desired to have the association discuss or act on.

In discussing Mr. F. B. Farmer's paper on "Responsibility for Torn-Off Air Hose," Mr. Carlton (C. & N. W.) told of having watched cars being switched in yards in St. Paul and in all cases the hose was pulled apart. They stretched badly, the pipes vibrated injuriously and in one case the lining of the hose was torn. Mr. Greenwade had seen angle cocks pulled off. Rules against pulling the hose apart in uncoupling cars, with penalties in case of violations, appeared to be general among the different roads, but the chief difficulty seemed to be inability to catch the switchmen at it. Some roads have their inspectors part the hose by hand before the train is pulled on to the lead preparatory to distribution, others require the trainmen to perform this duty, while still others have a helper accompany the checker as he goes over the train, and part the hose. The Northern Pacific tried at one point the experiment of detailing one man to this duty, with the result that the hose consumption was cut down 50 per cent. Mr. Burton said the Central of New Jersey gives close attention to the hose question. Inspectors part the hose on incoming trains in the larger yards. Regular inspections and tests of the hose are made periodically, the soapsuds test being used and all hose showing bubbles on being coated from end to end are taken off. All of the equipment is got over about once a year, and the average service of hose with them is 25 to 27 months. The inspectors are all impressed with the idea that the entire train line must be tight, and on their trains they have no difficulty in keeping up the pressure on 80 cars with one pump at ordinary speed. After some further discussion the recommendation of the paper was adopted.

The paper of Mr. S. J. Kidder (W. A. B. Co.) on "Electric Car and Train Brakes," contained no recommendations and was not discussed, being received as information.

A committee appointed to revise the constitution and by-laws in accordance with the President's recommendation, submitted a report recommending a number of changes, important among which was the vesting in the executive committee the authority to select the place of meeting. This has been done by the convention heretofore.

The subjects for the 1905 convention are:

(1) The Air Pump Suction Strainer and Automatic Lubrication of the Pump Air Cylinder.

(2) Train-Pipe Leaks in Freight Service: Effects, Causes, and How to Reduce.

(3) Maximum Braking Force as Regards Foundation Brake for Passenger and Freight Cars.

(4) Best Brake Rigging Design to Accomplish Harmonious Action of Hand and Air Brakes on Passenger and Freight Cars.

(5) Revision of "Progressive Questions and Answers."

Under new business Mr. P. J. Langan (D., L. & W.) spoke at some length of the condition of brakes on private line cars and moved that the committee representing the association at the M. C. B. convention bring the matter to the attention of that body with a view to seeing if something could not be done to remedy the conditions.

Topical Discussions.

On Tuesday a 15-minute topical discussion was devoted to the matter of best method of stenciling brake cylinders, triple valves and high-speed valves. The subject was suggested by Mr. Burton, who stated that not only do no two roads do this alike, but neither do any two points on any one road; and none follow M. C. B. recommended practice. Their scheme (C. R. R. of N. J.) is to show the name of the repairman, name of station at which repaired and date, and the initials of the road —each of these three items being on a separate line.

Mr. Stricklan (D. M. & N.) said their practice was to stencil the month and year of cleaning on the side of the auxiliary reservoir.

Considerable objection is found against the raised cast letters on the side of the auxiliary reservoir, as they interfere with stenciling and it was stated that there is a growing sentiment in favor of the omission of these letters, leaving the side of the reservoir smooth.

The question was asked by a member from the New York Central if any roads made a practice of stenciling the date of cleaning the high-speed reducing valve. The N. Y. C. does not.

Mr. Down (W. A. B. Co) was in favor of condemning the practice of stenciling the date of testing only, as productive of confusion, preferring stenciling only for cleaning, oiling and testing. Mr. F. B. Farmer thought that one stencil showing month, year and place is all that is necessary and this should cover minor repairs of the usual kind. Mr. Nellis suggested that the representatives of the different roads state their practice in writing, the whole to be submitted to a committee for study and the evolution of a recommended practice.

In a short discussion on Thursday, the matter of adopting the 1¼-in. air hose as standard was considered. It was recommended that during the coming year members observe the effects on this size hose of the higher train-line pressures and report the results at the next convention.

Exhibits.

The exhibitors at the convention were as follows:

The Ashton Valve Co., Boston, Mass.—Sample air gage.

J. R. Clancy, Syracuse, N. Y.—Sample of "Sure Grip" hose clamps.

Consolidated Car Heating Co., Albany, N. Y.—Sample parts of heating apparatus, hose couplings, etc.

Crandall Packing Co., Palmyra, N. Y.—Samples of Crandall air-pump packing.

The Dukesmith Air-Brake Release-Signal Co., Meadville, Pa.—Instruction car equipped with air-brake apparatus and the Dukesmith air-brake release signal.

John T. Fuhrman, St. Paul, Minn.—Sample triple valve-seat facing device.

The Garlock Packing Co., Boston, Mass.—Samples of Garlock packings for air pumps and throttles.

H. G. Hammett, Troy, N. Y.—Sample triple-valve bushing roller.

Harris Manufacturing Co., Greenville, S. C.—Harris combined train signal and indicator. This device was described in the *Railroad Gazette*.

H. W. Johns-Manville Co., New York.—Train-pipe covering and "Vulcabeston" specialties for air pumps.

John C. Lyons, McComb, Miss.—Improved engineer's brake valve and improved air-pump steam-head using balanced valve.

New York & New Jersey Lubricant Co., New York.—Samples of "Non-Fluid Oil" air-brake lubricant.

Performance of Automatic Signals Under Unfavorable Conditions.*

BY H. S. BALLIET.

III.—Operating and Controlling Mechanisms.

The signal controlling mechanism is a part in which there is room for improvement. The enclosed disk is the oldest form of automatic block signal now in use, and there is no doubt that it is the simplest and most reliable. The parts composing it are few and easily inspected. The method of operating the armature which carries the disks is by magnetic attraction through a curved armature. (See Fig. 2.) The disks are put to "proceed" by energizing the magnet and they are held in that position

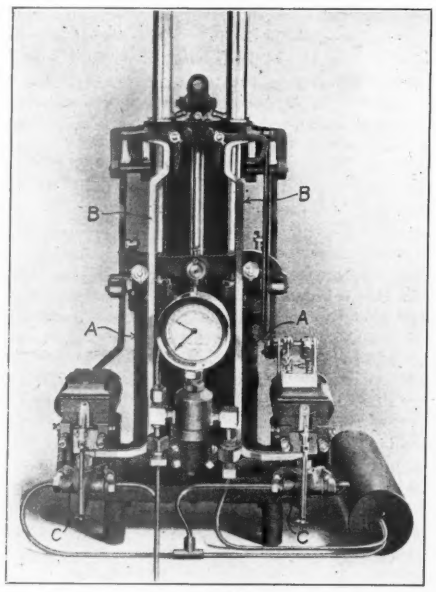


Fig. 1.—Electro-Gas Signal Apparatus.

by the same armature pull. When the flow of current is interrupted, and the magnet de-energized, the disks return to the "stop" position by gravity.

In the later designs an operating and a controlling magnet are employed, the latter being called the "hold-clear" magnet. (See Fig. 3.) The operating magnet, termed the signal magnet, has a curved armature, and the poles are separated from the armature by an air gap of about $^1/_{64}$ of an inch. This space is designed to be uniform, no matter what position the disk occupies.

The controlling magnet is an ordinary electro-magnet wound to a given resistance, and is used to hold the disks in the proceed position. The armature of this magnet, about $^1/_{16}$-in. thick and 6-in. long, is fastened to the revolving armature of the operating magnet in such a manner as to allow the latter to rest on the ends of the control magnets, an air gap of only about $^1/_{32}$ in. being maintained so as to get along with the least practicable amount of energy. The control magnets are so situated that a contact spring is opened when the revolving armature has reached the position to correspond to the proceed position of the disk, and this puts the operating magnet and the control magnet in series. The resistances of the magnets are usually arranged so as to consume, while the disk is being drawn from the stop to the proceed indication, about .150 ampere at 4.5 volts and .015 ampere after it has reached the end of its movement.

The control magnet thus saves much energy which otherwise would be wasted. In many instances the life of primary cells has by this means been prolonged 60 per cent.; when a signal battery is known to have operated a signal two years, its life has been extended to about 3¼ years. This saving is, of course, very tempting to the signal superintendent, but there is a new possible danger added by its introduction; the liability of the armature for this control magnet to become wedged or possibly frozen fast to its pole pieces.

To obviate this difficulty, a new design of control magnet has been introduced (see Fig. 6), and its location with reference to its armature has been changed. In this design the magnets are fixed in a horizontal plane, with their poles facing the edge of the armature and separated from it by an air gap of about $^1/_{16}$ in. The chance of interruption by wedging or freezing is anticipated. The magnets are wound to 600 ohms resistance, which further reduces the current needed. Only a small part of the enclosed disk signals now in service are equipped with the controlling magnet.

To make this design of signal as economical as possible from a maintenance point of view, the air gap between the curved armature and the poles has been made so small as to elicit criticism. The construction of the cloth or aluminum disk is such as to allow but very little counterweight when the magnets are de-energized and therefore a slight friction will cause the disk to remain at "proceed." Flies, spiders, grit, coal dirt and particles of steel broken from screw heads have lodged in the armature interrupting its operation. It may be said that neglect in maintenance is the cause of these interruptions, but as a practical matter most failures of this kind are beyond anticipation. A maintainer or repairman in making a systematic inspection must open the signal enclosure and not infrequently the faults are developed while the case is thus open. The obstructions may not lodge on the armature or pole piece while the inspection is in progress, but it is the open door that makes the trouble. Particles of coal or similar substances, scarcely perceptible to the naked eye, have been found to make trouble with these armatures. The air gap might be increased to $^1/_{16}$ in. with but slight increase in the cost of maintenance. A few of these instruments with $^1/_{16}$ in. air gap are now in service and are working satisfactorily. These instruments are on circuits where the current is .130 amperes at 4 volts. The test thus far indicates no increased cost in maintenance, but as it is unquestionable whether this will hold good in all cases, it will be best to allow an increase of one volt per circuit. This increase appears justified in the increased safety afforded.

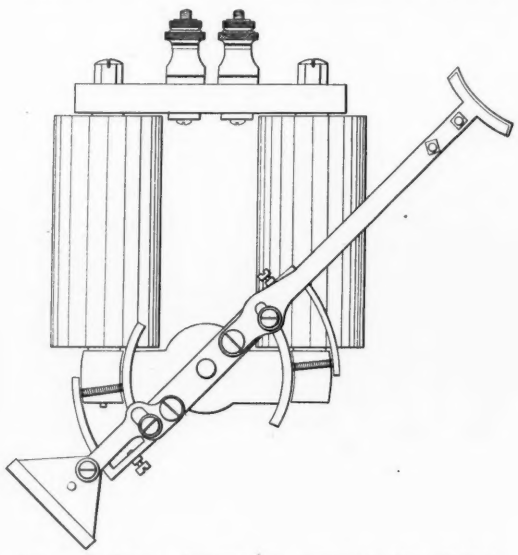


Fig. 2.—Signal Magnet for Enclosed Disk Signal.

As noted in a previous paper, moisture is collected within the enclosures containing these electro magnets and their armatures. These deposits occur at any season of the year, when conditions are favorable. When the moisture is thus collected and remains on the magnets, the wire terminals are slowly destroyed; corrosion sets in where they pass through the end pieces of their respective magnets, and it is necessary to renew them once in about every four years. A number of things have been tried to anticipate this interruption. Thus far shellac has proved best. It should be applied and thoroughly dried, before the magnet is installed. This will materially prolong the life of the wire. During the winter this moisture is liable to freeze the poles and the armature, thereby preventing the proper operation of the armatures.

The electric semaphore has now reached a good degree of perfection. In a general way, there is probably but little room for criticism, except in the motor and the parts controlling it. With the vertical rods and their connections within iron masts reduces the interruptions. In order that the semaphore arm may be quickly returned to the stop position when the clutch magnets are de-energized, sufficient weight is added to the spectacle casting, and the vertical rods and their connections to

*Previous articles on pages 137, 242 and 287.

compensate for any excessive weight which may be caused by the accumulation of wet snow or sleet on the arm. These counterweights are generally arranged so as to require a weight of two pounds at the extreme end of a 4½-foot arm to deflect it one degree. In the earlier designs of electric semaphores the arm is returned to the stop position by employing a 20-lb. oval shaped casting fastened to the balance lever supported several feet down on the outside of the mast. An automatic semaphore signal, which is so designed as to require a dead lift of 100 to 110 lbs. on the vertical rod when the arm is started from the stop to the proceed position, will require a coating of sleet, ice or snow of not less than two inches over its entire surface to cause it to remain at proceed. How much accumulation would be necessary to deflect the arm downward 10 or more deg., when so weighted is not known, as no records are available.

There are few instances where semaphore signals fail to return automatically to the stop position when conditions are favorable; but conditions do arise when the arms will remain at proceed.

In all the electric signals there is to be found an arrangement of gears, arms or other mechanical contrivance in conjunction with an electric armature (see Fig. 4), through which the arm is set to the proceed position by power transmitted from the motor. Not infrequently, the clogging of some part or parts through the medium of a stray screw dropping into moving parts, or absence of lubrication or the presence of frost and ice or rust, caused by water continually dropping from within the mast, cause failures in operation. Usually these failures do not cause a dangerous indication, but this is not unknown. There is but little weight available to start the arm from the proceed to the stop position unless everything is in good working order. Careful and regular inspection is the remedy.

On account of the numerous connections and contacts required in the various circuits operating electric motor signals, not a few failures are caused by sparking and dirty contacts. This trouble, unless anticipated, becomes a serious annoyance. Brushes on motor commutators have worked out of their holders and caused unnecessary stoppage of trains. Owing to the small power available, on account of the limited voltage generally employed, high resistances are not infrequently noted between commutator and brush.

The general practice of trying to operate the semaphore signal too cheaply is a cause of much unsatisfactory service. It is the custom to employ motors of about ⅙ h.p. to perform this function. Seven to 10 volts and 2 to 3.2 amperes are generally required to set the signal to the proceed position. The energy is supplied by 14 to 16 cells of primary battery capable of delivering between 8.4 and 10.6 volts at about 4 amperes for 300 ampere hours. This tendency toward cheap maintenance compels the reduction of the safety factor very perceptibly; for to make the air gaps and armature adjustments capable of working on a very little current, usually about $^1/_{10}$ of an ampere, they are made too small to be

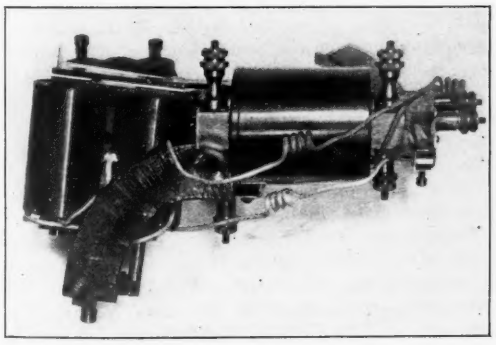


Fig. 3.—Signal Magnet and Hold-Clear Magnet—Old Style.

reliable. Secondary cells are installed at a few points, usually four cells, practically eight volts, being available.

If signals are to be relied on under all conditions motors of greater efficiency must be employed, so as to make available more current and voltage for the clutch armature; enough so that it may be farther removed from its pole piece, thereby decreasing its liability to remain in an improper position when the track section is occupied.

The most delicate part of the electric semaphore signal is the motor armature or commutator. In addition to interruptions previously noted, the accumulation of moisture on these armatures brings about many bad effects; it not only tends to destroy the insulation of the various connections, but it starts corrosion of the terminals and brushes. These conditions occur in the summer principally. In the winter the trouble is due to precipitation and afterwards freezing. While much has already been said about commutators, it may not be amiss to refer to the subject again, as my assertion in a previous article is now disputed in some quarters; I refer to frost on glass-enclosed commutators. In defense of this earlier statement, it may be well to inquire a little more closely into the construction of these so-called sealed or frost-proof commutators.

In the construction of any motor, it is practically impossible to cut off the circulation of air along the armature-winding where it passes between the poles. The practice is to place extra collars on the poles and on the commutator in such a manner as to make a good, close fit, but not an air-tight fit. To the upper collar is screwed the glass cover (B, Fig. 4). This same defect is found where celluloid and brass commutator covers are used. To do away with precipitation within these enclosures, it will be necessary to form a vacuum which cannot be accomplished in the present design of motor. Every design of motor, whether its commutator is open or closed, has failed from frost accumulation in given localities; though of course it must not be assumed that all motor signals are condemned by a few extreme cases.

It has been suggested that the frost conditions which cause so much annoyance are mostly due to the fact that mechanisms are not properly protected with reference to their connection with the earth. But I can cite the case of a certain signal which, when first installed, was frequently interrupted owing to frost accumulations; the mast being so designed as to allow communication with the ground. The following season, this mast was renewed and its mechanism placed within an iron case and all communication with the earth apparently cut off; but still there were failures from this same cause. Two seasons have now passed, and the interruptions do not appear to be any less than three seasons ago. In another instance, it was suggested that the motors be placed underground to get below the frost line. A test of this theory brought no better results.

The electric semaphore, as well as the enclosed disk, is subject to criticism because so little room is left between the armature (C, Fig. 4) which engages the vertical rods (commonly known as slot or

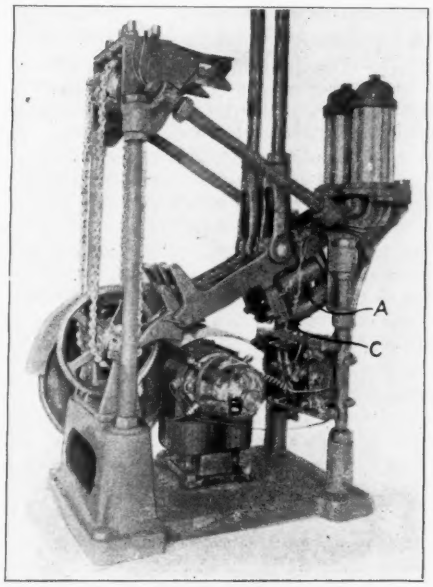


Fig. 4.—Electric Motor for Semaphore Signal.

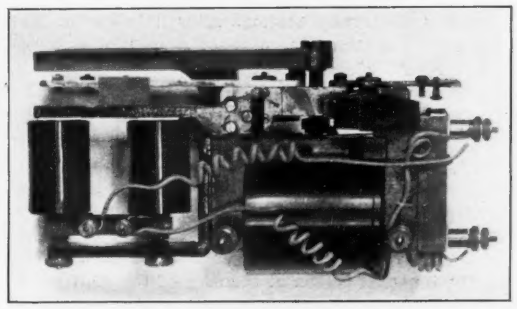


Fig. 6.—Signal Magnet and Hold-Clear Magnet—New Style (Top View Looking Down).

clutch magnet armatures) and the pole pieces of the magnet (A, Fig. 4). Not a few cases are reported where the moisture accumulated at this point has frozen the armature to the pole piece, making it impossible for the same to disengage and thus allowing the semaphore arm to return to the stop position. To meet this difficulty, thermal coils were arranged around the poles of the magnets and an effort made to keep them dry by heat, but it was only partially successful.

In justice to the various designs of slots and clutches, it can be said that with a little more air gap to guard against freezing, they can be made practically perfect. There is no chance for clogging or interruption as in revolving armatures, such as are employed in the enclosed disk.

To surely maintain the space between armature and pole piece, there should be a stop so fixed that the armature plate can never touch any part of its poles. It is this contact between armature and poles that causes the sluggish return or the freezing fast of the armature plate.

Practice indicates that the resistance of slot or clutch magnets should be low. The many turns which are necessary in high windings cause the slow release of the armature and in many instances appear to promote residual magnetism.

The electro gas semaphore overcomes many of the deficiencies noted in other designs. A few of these signals have been in service for two winters, but it was not until this season that the number was sufficiently large and their locations distributed over sufficient territory to give a good test of their efficiency.

There is little doubt that frost accumulations on motor commutators is responsible for this latest innovation. The liquid carbonic acid gas or carbonic dioxide gas possesses the property, if perfectly free from moisture, of absorbing vapor from air. Then again the low temperature of the chemical tends to keep the metallic parts at a uniform temperature, doing away with contraction and expansion.

But the gas cylinders (A, Fig. 1) by which the rods are operated by the admission of gas under a pressure of from 30 to 40 lbs. to the square inch, become chilled in extreme cold weather, and it is necessary to add extra counterweight to assist in the return of the semaphore arm to the stop position; and in such weather the discharge of gas into the enclosures when moisture is present in the gas causes large quantities of frost to be deposited on all moving parts, thereby interrupting their proper operation. With the use of levers (B, Fig. 1) to mechanically shift some parts, there is trouble because when frost is present the valves remain partly open, thus allowing a free escape of gas from the tank through the valve, without performing a function. In one design of these signals, the number of moving parts is reduced to a minimum, and there is little to be said against its general design. The magnets (Fig. 5) are properly located with reference to the gathering of moisture on pole pieces and armature plates are built on a horizontal plane. A good air gap is provided, making it practically impossible for it to become interrupted by freezing. These clutches and slots require an average of eight volts and .190 amperes of current to engage them and successfully operate the valve.

In the other design, the slot magnet is built on a vertical plane, and there is the liability to interruptions on account of frost and ice described in a previous paper.

The clutches or slots require more voltage and current to engage them owing to the pressure of gas on the diaphragm. When, however, the signal has been set to the proceed position, the energy can be reduced to a minimum by introducing extra resistances into the clutch or slot, thereby reducing the cost of maintenance somewhat. The cost for battery energy is greater for gas than for enclosed disks or electric semaphores, but this is warranted because of the extra protection guaranteed. The location of the clutch magnets, in the gas mechanism, is such as to discourage the accumulation of moisture on the pole pieces, what small quantities are collected readily dropping down between them and the armature plate. The air gap (A, Fig. 5) being very great, the drops of moisture will not lodge on the plate. This protection is a distinct departure from other forms of electric clutches or magnets thus far employed.

The experience of the past winter has shown that this gas will freeze at the valves, either at the reservoir or the signal mechanism (C, Fig. 1), interrupting operation; and it is necessary that the gas be used in an absolutely dry state if it is to meet extreme weather conditions. Probably the only way in which this dryness can be assured is by means of electrodes placed within the tanks. The expansion of this gas in warm weather causes the pressure to rise rapidly, and it is often the case that the

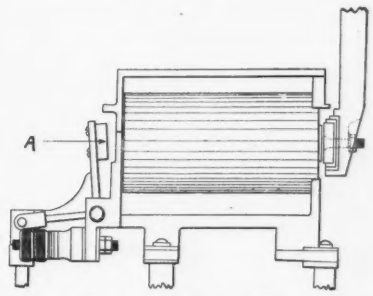


Fig. 5.—Clutch Magnet of Signal Motor.

pressure at the cylinder is raised from the normal 30 lbs. to 90 and even 100 lbs. This causes the arms to move too quickly, and is likely to bend or break different parts. It is impossible to maintain a reasonably even pressure during the summer. In the winter the sudden drop in temperature contracts the gas enough to cause the arms to operate very sluggishly, and unless a high pressure is continually available, there will be failures.

Circuit breakers located at switch points or on signal masts and used to open and close the various circuits are also subject to much interruption due to the accumulation of frost. It is a common sight to see these contacts completely covered with ice and frost. This condition is noted principally where an effort is made to keep the boxes air tight. All manufacturers as a rule supply rubber packing between the lid and the frame so as to exclude any water in case of flood. This condition is the direct cause for many unnecessary failures.

During the early morning hours in the summer the arms and contact springs will be found completely covered with dew and cases are on record where well defined leaks in circuits occurred on account of the presence of this moisture. Where these circuit breakers are used to control a distant signal, by repeating the position of the home arm, these springs are open for some time and it is a common occurrence to have a small coating of ice form on the contact blocks, insulating them and thereby causing the failure of the distant signal to move to the proceed position.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

A rear collision on the Third Avenue line of the Manhattan (Interborough) elevated railroad, at 56th Street, New York City, on May 9, in which the motorman was killed, has once more started discusion as to the propriety of requiring the presence of a second lookout man on all electric trains.* There is little new to be said on the subject, but it may be well to repeat one or two things that have been said before. The main thing, because it involves the most difficult problem, is that a second man cannot be effectively disciplined. As said by an officer of the Manhattan, if the two men were friendly they would converse and would thus distract one another from the duty in hand; while if they were unfriendly there would be no assurance that they would invariably look out for the interests of the company and of safety. The discipline of a man who has nothing to do, or who has that feeling, or whose duties are not well defined is the most difficult discipline in the world. One of the two men in a ferry-boat pilot house is normally the captain, who, though he does not take the wheel, has a responsibility and has had long training in the mental habits which make a good lookout. The second man on an electric car would be—what? Not of any higher grade than the steam locomotive fireman, and perhaps not so high. It is universal experience that firemen are often useless as monitors, even when not engaged in firing, because they have not the moral qualities to monitor their boss. Should the second man on the electric car be subordinate to the first? If not, who will supervise his conduct? The main point of the demand for a second man is that the motorman may faint or fall dead; but in the 56th street case there appears to be no question but that the man was alive and, at least for the last few seconds, was active. His error seems to have been either inattention for a brief period or miscalculation of distance. Where it is a question of a few seconds a little hesitation on the part of either the motorman or his monitor may annihilate the margin of safety; so that to make a monitor's service surely effective it would probably be necessary to provide him with a duplicate brake valve and controller, in order to have the most direct and shortest possible connection between his brain and the apparatus which his brain should affect. This point would have to be considered, if regular monitors were contemplated. There can be little question that the actual risk of a fatal accident which would be prevented by the employment of a monitor is very remote. Probably the Interborough Company could well afford to pay ten times what a court would assess for every passenger killed in collisions which a monitor would have prevented, rather than pay the wages of the monitors. With a controller-handle which shuts off the power and applies the brakes the instant that the man lets go of it, the danger most difficult to deal with is provided for. It is desirable that the handle be fixed as high as practicable, so that a lifeless hand would fall away from it by gravity; at the same time it must be easy to keep hold of, for if letting go is to cause an emergency application of the brakes the strain on the motorman's mind will be considerably greater than when letting go affects only the motor.

*On the afternoon of May 9 a southbound train which had been stopped near 56th street (Third avenue line) on account of track repair work going on, was run into at the rear by a following train, and the foremost car of the latter penetrated about 20 ft. into the last car of the preceding train. The motorman was killed and three passengers in the leading train were injured. One of the cars was pushed to one side so far that it came very near falling to the ground, and for more than an hour, surface street cars were not permitted to run beneath. The State Railroad Commissioners investigated the circumstances attending this accident, and in their reports, as given to the newspapers, they recommend that motor cars on this line be so equipped "that when the current to the motors is cut off by the action of the automatic cutout device now employed on the controllers, it will also operate the air brake system so as to cause an emergency application of the brakes on the train." It is said that the company already has this brake-setting device fitted to the cars which are to be used in the subway, and that the order of the Commissioners in relation to cars on the elevated lines will be carried out within a few months. With this device, if the motorman removes his hand from the controller handle the power is shut off and the air brakes are applied in the emergency application.

It has been suggested that where trains are constantly following one another at short intervals, as on the Manhattan elevated, the difficulty of estimating the speed of the train ahead is a considerable factor of danger, and that, therefore, a flagman should be stationed on the rear platform to give signals indicating the speed at which he is moving. But there would be much the same kind of objections to this as to the monitor for the motorman. His work would be too perfunctory. To inform the following motorman whether a train is moving at 5 miles an hour, or 2 miles or ¼ mile, is attempting too fine an adjustment. If the speed is over 10 miles an hour the fact that the car is moving is soon discovered; if it is less than that rate the only workable rule is for the following train to be brought under control at once. And why should not the term "under control" be so defined as to provide for a fixed margin of safety? It now means to stop before striking the train ahead. Why not instruct motormen (and enginemen) that it means stop 200 ft. short of the train ahead? Two hundred feet is a small margin; but even this short distance would in times of fog impose very low speeds. Possibly it would have to be made 100 ft.; but even 50 ft. is better than no margin, provided infractions of the rule are surely punished.

While we are on the subject of collisions on city railroads it should be noted that one of the greatest dangers of such an accident is the danger of killing passengers at the stations by crowding them off the platforms on to the track. The *Evening Post* criticises the police of New York City for not preventing the crowding of elevated stations after it is known that trains are not taking the people away. While the police in New York have been inefficient in this respect, the officers of the railroad are really the men who should provide against this danger. To give a prompt order to close the entrance gates, *at the foot of the stairs*, when a blockade of trains occurs, is as important, oftentimes, as to call the fire-engines in case of fire, for the crowding of a station platform may endanger hundreds of persons. In the case of an underground railroad the danger may be even worse, for the innocent person at the edge of the platform is at the mercy not only of the mob's misdirected reasoning, but also of the weight of its bodies, pressing down the stairway.

Terminal Electrification of the New York Central.

The New York Central has decided to use electricity for the operation of both suburban and through passenger service from its New York terminal at 42d street to Croton, a distance of 35 miles on the Hudson Division, and to North White Plains, a distance of 25 miles on the Harlem Division. About 8 miles of the Putnam Division, which connects with the elevated railroad at 155th street, will also be electrified. The boldness of this project leaves no doubt as to the confidence of the New York Central officers in the ultimate advantages of electricity for suburban traffic such as is handled by that road. It will be recalled that the Legislature of the State of New York passed a law authorizing the electrification of the road through the Park avenue tunnel and the obligations of the company would have been fulfilled by electrifying that portion of the road south of the Harlem River. But this plan would have made necessary the establishing of a terminal at some point such as Mott Haven just north of the river, and here making a change from steam to electric locomotives or from electric to steam locomotives on all trains passing in or out of the Grand Central Station. A change of this sort would necessitate the outlay of a large amount of money upon which no present or future return could be expected. Furthermore, there would have been, no doubt, a direct loss to the company by reason of the congestion of traffic at the Mott Haven terminal.

The commission appointed by the New York Central to study this problem, early recognized the desirability of extending the electric suburban service to Croton and North White Plains, for it is also possible that restrictive measures in New York City will require the electrification of suburban service as far as Yonkers and Mt. Vernon. The handling of the through traffic constitutes a separate problem and will be considered later. As previously noted in these columns, the territory just north of Manhattan Island has great possibilities as a suburban district and is, at present, the only suburban district which can be reached by an all rail route. By building up the population in this region, the New York Central can hold and largely increase its more remunerative long-haul freight and passenger business which otherwise might escape to other roads. Good suburban service will also discourage the building of competitive electric suburban lines. The experience of existing electric lines has shown that the opportunities for increasing suburban traffic are due to small units, frequent service, high speed and freedom from smoke, cinders, noise and gases, all of which advantages can only be realized by the use of motor cars. The multiple-unit system of train control will give the desired flexibility which makes for economy in operation. If corporate differences can be overcome it will be possible for local cars to take up passengers throughout suburban towns and villages and then join an express line and pass at high speed to the urban points of distribution. At these points the train may again be split up into separate units and pass to the various parts of the city over the existing underground or elevated roads. Even if corporate differences prevent the full development of this scheme, it will be possible to divert much of the traffic to the several local roads running north and south through Manhattan Island, instead of concentrating it at one point—the Grand Central Station.

The through passenger traffic at the Grand Central Station consists of about 150 trains each way per day. These trains are frequently made up of from 13 to 16 cars and are hauled at high speed. The handling of this traffic is, of course, independent of the suburban business and, in so far as present legal restrictions are concerned, the change from steam to electricity could be made at Mott Haven. But as before noted, future restrictions in New York City or the force of public criticism might compel the road to move its terminal farther north, while the topography and cost of land also preclude adequate sites for a terminal south of North White Plains or Croton. Moreover, it would annul many of the advantages of the electrified suburban service to have noisy and dirty steam locomotives passing through the suburban district. With these considerations in view it was deemed wise to build the terminals at the above-mentioned points where land is relatively cheap. The necessity for three separate terminals is done away with, and the saving thus made will offset in a measure the additional cost of extending the through electric service to Croton and North White Plains.

The dizzy speed with which steam and electric roads are combining in Southern New England is once again accented by the announcement that the New York, New Haven & Hartford will sell out its large trolley system in New Haven to another of its controlled trolley companies, the Worcester & Connecticut Eastern, situated chiefly in Northeastern Connecticut and a hundred miles away. The latter corporation is financially infirm, last year earned but a small fraction of its fixed charges and had to receive $125,000 "contributions by stockholders" to make its fiscal ends meet for the year. To this corporation is to be sold a trolley system, the largest and most prosperous in the State, for whose stock the steam company a few weeks ago paid $9,000,000 in its own bonds. Why, in this case, the Mountain goes to Mahomet, or in more trite phrase, "the tail wags the dog," is due to the fact that the weaker company owns a charter of the most elastic and expansive quality as regards acquisition, functions and powers. We have President Mellen's statement that under this charter are to be merged under the title of the "Consolidated Railway Company" all the trolley properties of his corporation which, in Connecticut alone, would mean the merger of 209 single track miles, some $11,000,000 of stock and bonds at face value, and several millions more at market price of the various securities. But this new function of President Mellen's corporation as a "holding" concern on a large scale is less expressive in itself than as an omen. This corporation in common parlance is now the "Consolidated Railroad"; his new trolley combine is to be the "Consolidated Railway." Change but one syllable and

we have, symbolically at least, that blending of the two under one motive power, as to which President Mellen himself has already gone on record as a prophet.

The Supreme Court of the United States on Monday last decided that a fireman and a telegraph operator are fellow servants, holding, in the case of Dixon against the Northern Pacific, that the widow of Dixon could not recover damages for his death in a collision caused by the error of an operator who misinformed the train despatcher as to the whereabouts of a train. The opinion was prepared by Justice Brewer. Though the press despatches give only a short abstract, it is safe to say that it is supported by a strong array of earlier decisions. In view, however, of the agitation in many States in favor of statutory regulation of employers' liability in cases where one employee is injured or killed by the neglect of another, the most interesting feature of the present case is the fact that it was decided by a vote of five to four, Justices White, Harlan, McKenna and the Chief Justice joining in a dissenting opinion, prepared by Justice White. This opinion holds that the operator was the agent of the employer. The opinion was also expressed that the decision would create much confusion. The majority had definitely decided that the negligence of the operator was not the negligence of a vice principal.

In two cases against the Texas & Pacific, the Supreme Court decided that a bill of lading for cotton, exempting the railroad from liability for damages by fire, was valid. The exemption clause was attacked on the ground that the carrier could not limit his common law liability without the consent of the shipper, and the mere contract of shipment was not such a consideration; also, that there must be a reduced rate as an inducement, and both the lower and regular rate submitted to the shipper. The decision against these contentions was sustained.

Michigan Central.

The report of the Michigan Central for the year ending Dec. 31, 1903, shows the largest gross earnings in the history of the company, with a gain of $3,507,118 over 1902. Of this amount, freight earnings contributed an increase of $2,882,103 and passenger earnings an increase of $375,632. In direct contrast to last year, when the number of ton-miles decreased, the report for 1903 shows the large increase of 492,637,775 ton miles. The greater share of this increase had been due to the rapid growth of both local and through freight. The average rate on the former was slightly less during the past year, but the average rate on the latter was the same, as the large increase in the rate of eastbound freight more than offset the large decrease in the rate of westbound freight. The following table gives the average rate (in cents) per ton per mile for the last six years.

	Eastbound.	Westbound.	Through.	Local.
1898	.435	.490	.441	.716
1899	.391	.457	.408	.691
1900	.430	.458	.437	.737
1901	.453	.464	.456	.760
1902	.522	.516	.520	.775
1903	.556	.452	.519	.761

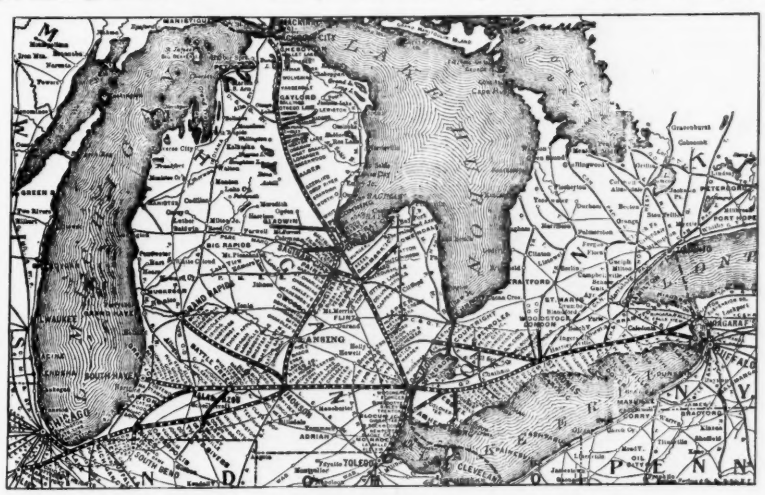
During this period, the total average ton-mile rate has varied between 597 mills in 1898 and 676 mills in 1902.

Operating expenses and taxes were $18,862,320, as against $15,467,504 in 1902, leaving an increase in net for the year of $112,318. The details of operating expenses show that although the charges for maintenance of way and structures decreased $300,178, the charges in the maintenance of equipment and conducting transportation departments were very heavy. The more important of these increases were as follows: $820,030 for repairs of locomotives, $232,208 for repairs of freight cars, $802,983 for higher cost of fuel for locomotives, $433,848 for car mileage and material increases in the wages in all departments.

In addition to these charges for maintenance, the sum of $1,957,859 for repairs, renewals and new rolling stock was charged to the construction account. Of this, the largest item, $980,262, was for the purchase of 1,050 new coal cars, and $316,928 was for building a second track from Marshall to Kalamazoo. To provide for the above fund for current construction expenditures and for the balance of $648,000 for construction expenditures in 1902, the company issued during the year $2,000,000 Michigan Central first-mortgage bonds, leaving the balance to be provided for from the sale of additional bonds amounting to $606,000. This issue was a part of the $18,000,000 3½ per cent. first mortgage bonds which were authorized in the spring of 1902 for betterments. After payment of all fixed charges, the income available for dividends amounted to 6.64 per cent. on the capital stock, as compared with 5.92 per cent. in 1902. The summary of the year's operation follows.

	1903.	1902.	Increase.
Gross earnings	$22,552,201	$19,045,083	$3,507,118
Operating expenses	18,862,320	15,467,504	3,394,800
Net earnings	3,689,881	3,577,579	112,318
Interest and rentals	2,144,952	2,210,778	*65,826
Net income	1,244,773	1,110,646	134,127

*Decrease.



Michigan Central.

TRADE CATALOGUES.

The Norton Emery Wheel Company, Worcester, Mass., publishes a catalogue describing the various types of machines adapted for cutter and reamer sharpening. Instead of using the five-speed countershaft, the machines are run by a single-speed countershaft which is arranged with an automatic belt tightener to compensate for slackness of belt in elevating the head. The machines are furnished with different attachments which are designed for holding all forms of milling cutters and which are interchangeable. The Universal Vise is the largest of these and is adapted for horizontal, vertical and angular operations. If so desired, each machine may also be furnished with an automatic feed attachment fitted with different size gears for determining the speeds of table travel. This latter attachment is especially adapted for surface and cylindrical grinding. The catalogue also contains tables of prices and dimensions of various parts of the machines, and is fully illustrated with half-tones and line drawings.

The Exchange for May publishes a letter from L. W. Wells, Chief Engineer of the Texas Midland Railroad, giving some interesting facts with regard to the durability of ruberoid roofing. In the letter, Mr. Wells says that this form of roofing, which was placed on the shops of the Texas Midland at both Paris and Terrell, Tex., in 1895, lasted, without repairs, until 1904. Several interesting half-tones are shown of railroad shops and buildings where ruberoid roofing has been used.

The Haverhill Eclipse Dry Dust Fire Extinguisher, made by the Haverhill Fire Appliance Co., Haverhill, Mass., is described in a pamphlet issued by the company. The tube contains a chemical dust which upon meeting the fire generates 2,000 times its volume of fire-killing gases. It is claimed that it will extinguish fires that water has no effect upon, such as oil, gasoline and electric fires; and that it is not harmful to persons or materials, nor injurious in any way to the finest fabrics. The pamphlet contains a large number of testimonials from fire chiefs and other users of the extinguisher. Adreon & Company, St. Louis, are Southwestern Sales Agents.

Compound Locomotives in France.

In the *Railroad Gazette* April 8, 1904, was an abstract of a paper by M. Edward Sauvage on the above subject read before the March meeting of the Institution of Mechanical Engineers. The following notes are taken from published reports of the discussion of this paper, which appeared in *The Engineer* and *Engineering* of London.

Mr. H. A. Ivatt, of the Great Northern, England, said that he compounded two engines in 1894 and 1895. One was a six-coupled freight engine, and the other a four-coupled express engine. As simple engines, both had inside cylinders, 18 in. x 24 in., and they were compounded on the Worsdell and Von Borries system, with the high-pressure cylinder 18 in. and the low-pressure cylinder 26 in. in diameter; the stroke in each case remained as before—namely, 24 in. The freight engine had a flap intercepting valve, and the express engine had a change-valve of the speaker's own design, allowing the engine to be worked non-compound when required. The steam pressure in both engines remained the same as before compounding—namely, 160 lbs. This pressure was adhered to with a view to seeing whether compounding alone produced any improvement. The engines remained at work until they required new cylinders, when they were re-cylindered as simple engines. As compounds the engines were no better and no worse than they were before. The engines on which this experiment was made were of moderate size, and it did not follow that for a more powerful engine the compound four-cylinder, or other type, would not show to greater advantage. The experiments now being carried out on the Great Western between compound and simple engines were of the greatest interest and value, because the conditions as to steam pressure, etc., were nearly identical. The speaker thought, however, that the trials would be still more interesting if the simple engine had the same arrangement of cylinders, cranks, wheels, etc., as was present in the compound engine, the cylinders being of such dimensions as to make the nominal tractive force of the two engines about equal.

The measure of useful work of a locomotive was the draw-bar pull at the back of the tender. Indicator diagrams might give the horse-power developed in the cylinders, but they would not show what horse-power was delivered to the train in the shape of draw-bar pull, particularly at high speeds, because part of the cylinder horse-power was required to overcome the resistance of the engine. This resistance tended to increase, and the draw-bar pull to decrease, with increase of speed, so that for every engine there was a maximum speed at which it would only move itself, leaving no pull available at the draw-bar. The diagram, Fig. 1, gives the draw-bar pull of an eight-coupled engine (line A) with small wheels used in heavy freight service at an average speed of 20 miles an hour and an express engine (line B) with a single pair of drivers. The initial pull of the "single" engine is not as great as that of the freight engine, but after a speed of 30 m.p.h. is reached, the "single" engine shows the better pull.

The diagram was made from records obtained in regular service, and therefore was not to be taken as representing the highest effort of which the two engines were capable at all speeds, but rather as illustrating the relative falling off in draw-bar pull with two different types of engine as the speed increased. The single-wheeled express engine, which at starting was only capable of putting on a draw-bar pull of about half as much as the eight-coupled engine, was able to put on the greater pull at higher speeds—say from 30 to 40 miles an hour and upwards. The diagram illustrated two extremes, but it indicated why some express engines with nominally small tractive force often did so well with heavy trains at high speeds, and it also helped to show why enginemen working trains timed at high average speed would always go for what they called a "free-running engine." By this expression they meant the engine which gave the best draw-bar pull at the higher speeds, and the engine which did that was the one that consumed the smallest amount of power in moving itself, and left most power for the draw-bar. The increased tractive force required by reason of the increased weight and speed of express trains had led to the use of the larger cylinders; but, the speaker said, large cylinders with high piston speed meant more back pressure, and consequently increased internal resistance. Dividing the work between four cylinders enabled them to be kept small, and the reciprocating weights balanced each other, so that no excess balance was required for the purpose; consequently there was no vertical disturbance, and this would help to diminish internal resistance. With four cylinders there was an increased friction due to additional parts, but the speaker thought that this might be more than compensated for by the advantages he had mentioned.

Another factor affecting internal resistance was the throw of the coupling-rods. The driver's ideal of a free-running engine was the single-wheeler, and most engineers would do without coupling-rods altogether if they never had to run trains weighing more than 150 tons over a moderate road. But being obliged to use coupling-rods, it was advisable to avoid swinging them about more than was necessary, and therefore the throw of the coupling-rod pins should be kept as small as possible. The circumference of the circles described by coupling-rod pins ranged from 7.8 ft. with a 15-in. throw, down to 4.7 ft. with a 9-in. throw. Several express engines were running with a 9-in. throw for the coupling-rod pins. Mr. Ivatt himself used 10 in. for inside cylinder engines on the Great Northern, and he was sure that keeping down the throw of the coupling-rods had an important effect on the internal resistance of the engine. It was his opinion that the success of the express engines described by M. Sauvage was largely due to increased boiler power and the arrangement of cylinders, apart from the compound principle; but to whatever cause their advantage might be due, everyone would admire the very excellent work done by them, and would congratulate the French engineers upon the success attained on the other side of the Channel. Referring to what had been said about extra complication introduced by the use of the four-cylinders instead of two, Mr. Ivatt pointed out that it had been stated more than once that with modern high-speed locomotives it was the boiler, and not the engine, which gave trouble, so that some extra complication of parts of the engine need not be greatly feared, so long as the design was well conceived. Mr. Ivatt had also showed a formula by Professor Goss, which enabled the draw-bar pull of a locomotive at various speeds to be calculated.

This formula was published in the *Railroad Gazette* Jan. 17, 1902, and was derived from Professor Goss's experiments at Purdue University. It would be noticed, the speaker said, that the formula turned more on the speed and the heating surface than on the size of the

cylinders or steam pressure. Mr. Sturrock, formerly the locomotive superintendent of the Great Northern, had said that the power of the locomotive was "measured by its capacity to boil water," and his practice of 50 years ago indicated that he had acted upon that opinion, while modern practice showed the opinion to be sound. It had always seemed to the speaker that attempting to measure the power of locomotives by the size of the cylinders was like trying to arrive at the relative spending capacity of two individuals by comparing the sizes of their purses without reference to the state of their respective banking accounts. Moderate sized cylinders were capable of doing a great deal of work if well supplied with plenty of steam. Adding to the size of the cylinders with a view to obtain increased power did not result in a gain if the effect of the increased volume were to augment back pressure, thus neutralising any advantage secured on the driving side. Increase in back pressure caused by enlarging the piston acted on the whole area, while the gain on the driving side was only that due to the additional annulus representing the increase in diameter. Many locomotives were over-cylindered, and disappointment in their working had been due to the cylinders being too large for the boilers rather than to any defect in the method of handling the engines while at work. The enginemen and firemen who worked heavy trains obtained, by constant practice, the greatest skill in obtaining the maximum draw-bar pull, and they knew how to accomplish this with the smallest expenditure of coal and water. The text-books indicated that he should run with the throttle wide open, and regulate the steam required in the cylinders by altering the point of cut-off with his reversing gear; in other words, he should work the steam as expansively as possible. But if he does this he will use more water, and consequently more coal, than he would if he ran with a cut-off at the point which the engine "liked best," and regulated the supply of steam by wire-drawing at the throttle. Mr. Ivatt would not profess to explain the scientific reason for this, but the fact remained, and it might help to reconcile engineers to the failure of various so-called improved valve gears which had been tried at different times. A locomotive fitted with complicated gear, which produced diagrams with beautiful square corners, was, he believed, no better in practice than one with the old link motion, which very likely turned out a diagram shaped like a leg of mutton.

Mr. S. W. Johnson, of the Midland, referred to some experiments made with simple four-wheel coupled passenger engines by Mr. Drummond, on the Caledonian Railway in 1889, the boiler pressure being 200 lbs. From these experiments it was concluded that the most economical results as regards coal and water consumption, were obtained with simple engines when the pressure did not exceed about 175 lbs. Mr. Johnson had remembered this when designing some very powerful express engines for the Midland in the year 1900, and had concluded that to take full advantage of the benefits of higher pressure, a greater range of expansion was necessary; this could be obtained only by compounding. If the compound engine were carefully worked, it afforded most elastic conditions to meet varying requirements in regard to economy for both light and heavy working. The writer next referred to the Smith three-cylinder compound type of engine as introduced on the North-Eastern Railway. In this system, by the introduction of an extra cylinder and valve-gear, and by an increase of boiler pressure up to 195 lbs., an increase of power for the simple engine of 35 per cent. had been obtained. The additional high-pressure cylinder and gear connected to a central crank on the driving axle, intermediate between the two low-pressure cylinders, was, the writer said, a simple arrangement. The arrangement of cylinders, with steam-pipe and steam-chest in line with the smoke-box, offered the minimum amount of surface for friction. The engines could be worked as compound or semi-compound, and thus would be suitable for light or heavy traffic. In this arrangement the steam-pipe came out of the boiler, and passed through the smoke-box direct, delivering superheated steam to the steam-chest. Continuing, the writer said that this three-cylinder arrangement had the following advantages: (1) It gave ample starting power, by reason of the automatic regulating valve, and because two of the cranks were always operative; (2) small first cost; (3) fewer detail parts and less friction, and consequently economy in both oil and coal.

In the four-cylinder engine, the distribution of power on two axles, and the balancing of the reciprocating parts as set forth by the author in his paper, were desirable conditions; these, however, were necessarily accompanied by outside pipes from the boiler to the high-pressure cylinder, and, again, from the high-pressure to the low-pressure cylinder. The adhesive weight of 36 tons, the writer thought, was light for such a powerful engine; but M. Sauvage had expected that this would be increased to 40 tons. It was yet to be ascertained how far the three-cylinder arrangement, with a central crank, would admit of further increase in size of cylinders and higher pressures. The Midland engine, owing to conditions of working, had been about 26 per cent. less powerful than the Paris-Orleans engine; if an equivalent boiler pressure were used, that difference would be reduced to 8 per cent. The results obtained by the working of these three-cylinder compounds had been highly satisfactory, both as regarded loads taken and economy in working.

Mr. V. Pendred said it seemed to him that, with the very high speeds of the present day, engineers were arriving at a new era, in which the conditions were different from those of the past, and it was highly desirable the inquiry should be carried out with a view to ascertain the effect of locomotive resistance—whether internal friction, air resistance, or whatever it might be.

Mr. Sisterson, of the London & Southwestern, and another speaker referred to some diagrams made by Mr. Dugald Drummond to test the power absorbed by light engines. Mr. Sisterson, who had charge of the trials on the London & South-Western made for purpose of testing power required to drive light engines at speed, explained that the reliability of trials was spoiled owing to unsuitable nature of the road. They had no long stretches of level road on their line. The trials were made starting on a slight down grade, and running round a curve on to the level. Considerable power was lost in driving the engine round the curve, and it was found impossible to eliminate the effect due to acceleration. Nevertheless, the results were instructive. A very fine set of indicator diagrams were taken from one of Mr. Drummond's 6 ft. 7 in. expresses, showing how, as speed increased, the height of the diagram increased; so did back pressure. For the diagrams taken at 67 miles per hour he claimed an equal turning moment, nearly, after correction had been made for inertia of reciprocating parts. At this speed of 300 r.p.m., 77 lbs. per sq. in. was necessary to give reciprocating parts their proper acceleration at commencement of stroke, viz., about 1,000 foot-seconds per second. Hence the higher the speed, the more necessary—for equal turning moment—that the height of the diagram should be increased and its alternation become more pronounced. M. Sauvage, in his paper, said short cut-offs were not resorted to at high speeds with compounds; this was in accordance with the speaker's experience. In 1902 Mr. Sisterson had an opportunity of investigating the work of the Midland express engines on the Leeds-Carlisle section. One of these engines was a compound. From his observations he could not make out that any economy was obtained from the compounding. It took its turn with the other engines, but its running at high speeds was noted for a long cut-off, 50 per cent., and a pounding action of the piston in the cylinders due to excessive back pressure and improper pressure to accelerate the reciprocating parts. Long cut-offs did not produce the form of diagram for equal turning moments. In these engines high-pressure steam was automatically introduced into the receiver. This, while it improved the action of the low-pressure cylinder, increased the back-pressure in the high; but this was not compounding. There was a difference between the four-cylinder compounds and all other compounds, namely, the enormous boiler pressure. This, no doubt, gave a more suitable form to the steam diagram, and enabled a shorter cut-off to be used; but the remedy was a serious one, and must entail enormous wear and tear of fire-boxes. Unless great variation of the cut-off was obtainable, how could the locomotive accommodate itself to the varying demands for power. One moment you were developing, say, 800 horse-power, and a few moments later you had mounted the top of the grade, and only required sufficient steam admitted to the cylinder so that the effects of the reciprocating parts were neutralized. It was taken for granted that the locomotive was an uneconomical machine; as a matter of fact, one of the engines he had tested had developed 1 h.p. hour for within a fraction of 2 lbs. coal, and he had no doubt that by the application of a feed-water heating arrrangement invented by Mr. Drummond that would be got down to 1¾ lbs. coal per indicated horse-power. No doubt some of their electrical friends might make capital out of the statement that 900 h.p. were necessary to drive the locomotive only at 70 miles per hour, but it must be remembered they were running against a very rough wind; he could not assign a less traction than $40 \times 100 = 4{,}000$ lbs. for air resistance only.

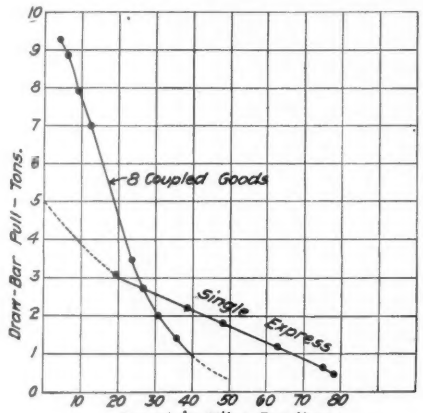


Fig. 1.

Mr. Rous-Marten gave an account of his experience with de Glehn compounds in France. With a train of 305 tons behind the tender, one of these engines covered 10 miles of level and rising road at 120 kiloms. per hour, the steam being well maintained. A train of 309 tons was hauled up a 13-mile bank at 62.1 miles per hour, every kilometer being done in the exact 36 seconds all the way up. A 270-ton train was taken up a bank eight miles long at 1 in 125 at a speed which never fell below 53 miles per hour. Concluding, he gave a list of what he conceived to be the advantages possessed by these du Bousquet-de Glehn compounds. Amongst them was the driving on separate axles, which caused less strain and produced a better balance; the use of a pressure as high as 228 lbs.; the adoption of the Walschært's gear; the use of a boiler having 2,300 sq. ft. of heating surface; the power of working simple when desired, the possibility of making a very quick start; the ratio between H.P. and L.P. cylinders, and the angle at which the cranks are set.

Mr. Druitt Holpin said that the steam locomotive far from being wasteful, might be looked upon as the most economical engine made by man, and this was because its power was used directly without any intermediary. He thought that if the electrical people would look into it, they would find that their locomotives, with their reducing gearing, etc., were far less economical than the steam locomotive, when the horse-power was referred not to the motors but to the rail.

In closing M. Sauvage said that the maximum speed of trains was not now much greater than it had been years ago—it was the average speed which had been raised. It was not always at economy that the locomotive designer had to aim; sometimes it was a question of getting the maximum power only. On the question of draw-bar pull, he admitted that two tons is very hard to get and to maintain, but some of the Paris-Orleans engines had reached 2⅓ tons at a speed of 65 to 70 miles per hour, the indicated horse-power reaching about 1,900. There was, he said, no reason to suppose that the resistance of French rolling stock was less than that of English. Touching upon the question of pressure, he said that whilst 180 lbs. had been found very economical as far as coal consumption, when they had been obliged to resort to a higher pressure in order to increase the power of the engines. The claim made by Mr. de Glehn that the engines compounded on his system had a more regular turning had been challenged, and he wished to explain that the claim had been misunderstood. He did not mean that the engines had a better turning movement, but that they were in better balance when opposite cranks are used, and hence balance weights are not required. Replying to Mr. Smith, he confirmed his experience that the range over which compound engines were economical was much greater than generally supposed. He quoted three cases. Trains of 220, 260, and 352 tons, using respectively 23 lbs., 22.6 lbs., and 23.7 lbs. of water per effective horse-power per hour.

A Rational Basis for Calculating the Braking Power of Passenger Cars.

At the meeting of the Air-Brake Association in Buffalo last week, Mr. F. M. Nellis, Secretary of the Association, presented a paper in which he proposed a new basis for calculating the braking power of passenger cars, on the ground that the present plan of braking passenger cars upon the basis of 90 per cent. of the weight of the car is not the most advantageous nor the best available plan. The percentage method, adopted long ago, has been extended to the heavier cars of to-day with apparently little thought as to its perfect adaptability to them. The 90-per cent. basis permits the heavy car to carry more unbraked weight than the lighter car, a 100,000-lbs. car leaving 10,000 lbs. unbraked, while for a 50,000-lb. car it is one-half that amount, giving a heavier braking power per wheel for the latter, with skidded wheels as a probable result. Heavy cars seldom if ever have their wheels skidded in a train containing lighter cars.

A better method would be to base the braking power on the dead weight carried per axle. If on a 45,000-lbs. car, braked at 90 per cent., each axle carrying but 1,250 lbs. of dead, or unbraked, weight, the wheels do not slide, it would seem logical that the wheels under a car of 100,000 lbs. would brake to a limit which would permit of its carrying 1,250 lbs. of unbraked weight per axle also. The author of the paper concluded that this would be the better method and would give a constant basis.

Two years ago Mr. G. W. West, Superintendent of Motive Power of the New York, Ontario & Western, gave his permission to equip a train in accordance with this basis. The train was ideal for the purpose, including a wide range of car weights, from 47,000 lbs. to 103,000 lbs.; also sizes of brake cylinders, embracing 10-in., 12-in., 14-in. and 16-in. diameters. Prior to beginning the experiment, the lighter cars, with 10-in. cylinders, were skidding wheels badly, and the braking power had been reduced to 67 per cent. in an effort to get away from the trouble. There was no trouble from wheels sliding under the heavier cars.

Another interesting feature in connection with this work was that of basing the braking power on a 50-lb. pressure in service application, instead of the usual 60 lbs. in emergency. It is well known that the larger passenger brake cylinders do not develop full 60 lbs. in emergency application from 70 lbs. train-line pressure, although 60 lbs. is obtained in the 8-in. freight cylinder, and is closely approached in the 10-in. passenger cylinder. But in the 12, 14 and 16-in. cylinders 60 lbs. is only approximately reached. Hence the author expresses the belief that 50 lbs. is the truer and more practical cylinder-pressure basis, since the service application is made a thousand times where the emergency is made once. He therefore deals with the brake as a service brake, asserting that it gains in the usual degree as an emergency brake.

Each car had the brake cylinder equipped with a West-

inghouse high-speed automatic reducing valve, set at 50 lbs., for protecting the wheels should the hand-brakes carelessly be left set, and also giving a maximum uniform cylinder pressure at all times regardless of the variation of piston travel. The experiments proved this a wise safeguard.

The unbraked weight per axle was assumed at 1,500 lbs., based on the unbraked weight of a light car. A noticeable feature of the new arrangement is that all cars brake uniformly with respect to the pull on the drawbar, there being an absence of surging of the train during brake application, due to the unequal braking of the several cars in the train. Each car appears to be doing its own share of the work of stopping the train.

The writer of the paper has been brought to a belief that all slid-flat wheels are not due primarily to high braking power, but that many are caused by the surging and jerking of trains whose cars are not uniformly braked. An example is given of a locomotive pulling a train up a heavy grade. If it once slips, the slack of the train will run in, due to the spring draft gear being relieved of tension, and a surging back and forth is set up at different points in the train, which "pulls the engine off of its feet" again almost as soon as it recovers from one fit of slipping. This surging, which causes the locomotive to slip, will conversely be set up during a brake application and break the adhesion between wheel and rail. This adhesion would have proceeded harmoniously had it not been disturbed by this outside influence, which resulted in the wheel being "pulled off of its feet."

Accompanying the paper was a table of results giving all particulars regarding kind of cars and weights, cylinders, braking power and unbraked weight under each plan, the increased braking power and reduction of unbraked weight by the new plan, and the total leverage. The following figures have been taken from that table:

		Increased braking power in service application.	
Kind of Car.	Weight, Lbs.	Lbs.	Per cent.
Smoker.	46,300	14,660	32.
Coach	54,100	17,504	33.
Coach	54,000	17,504	33.
Coach	56,800	11,816	21.
Coach	56,900	24,396	43.
Baggage	59,000	11,560	19.5
Baggage	59,920	20,160	33.
Parlor.	103,000	24,392	24.

Total weight of train = 490,020 lbs.

Total braking power, all cars, service application, old plan, = 294,300 lbs., = 60 per cent.

Total braking power, all cars, service application, new plan, = 436,292 lbs., = 89 per cent.

Additional brake power produced by new plan = 141,992 lbs., = 29 per cent.

TECHNICAL.

Manufacturing and Business.

Robert H. Groff, Secretary of the Pennsylvania, New York & Long Island R. R., 85 Cedar street, New York, asks bids, until June 2, for excavating for the terminal station in New York City, and for building of a retaining wall around it, as advertised in the *Railroad Gazette*.

The Denver, Enid & Gulf Railroad Co. is planning to put in some additional machinery and shop tools at Enid, Okla. T.

Mr. J. C. McQuiston, until recently Secretary, has been appointed Superintendent of the Westinghouse Companies' Publishing Department.

The International Railway Signal Company, of Winston-Salem, N. C., is in the market for electric equipment, building materials, boilers and engines.

The Pressed Steel Pole Company, of Jersey City, has been incorporated with a capital of $125,000 in New Jersey by C. L. Wilson, John Roland and others.

Orders have also been received from the Chicago & Eastern Illinois, Southern Pacific, Louisville & Nashville, Missouri, Kansas & Texas, Pere Marquette, and other roads.

Bids are wanted June 11 by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for boilers, turbines, generators and condensers for the naval station at New Orleans, La.

The M. D. Knowlton Company, Rochester, has been incorporated in New York with a capital of $400,000 to make machines. The directors are M. D. Knowlton, F. K. Knowlton and A. D. Knowlton, all of Rochester.

The National Cellular Steel Company, recently incorporated with a capital of $300,000, has leased a plant in Covington, Ky., in which modern machinery will soon be put. James M. Rude has charge of the improvements.

The Jones Electric Manufacturing Company, of New York, has been incorporated with a capital of $50,000. The directors are S. F. Jones and H. H. Sherman, of New York, and O. C. Prasse, of West New Brighton, N. Y.

The United States Steel Corporation has received a contract from the Canadian Government at $1,250,000 for structural steel to be delivered during this year at Montreal to be used in building 14 steel freight sheds on the docks.

The "Solid" draft rigging, made by the Solid Draft Rigging & Equipment Company, Terre Haute, Ind., was specified for the 10 locomotives being built by the Rogers Locomotive Works for the Southern Indiana, reported in our issue of May 6th.

The Coughlin-Sanford Switch Co. is now installing its swing rail frog on the Louisville & Nashville, Cincinnati, New Orleans & Texas Pacific, St. Louis & San Francisco, Pittsburg, Shawmut & Northern, and Cincinnati, Hamilton & Dayton.

The Winter Bros. Company, of Wrentham, has been incorporated in Massachusetts with a capital of $25,000 to make thread-cut tools and other tools with John E. Winter President and Murray Winter Secretary and Treasurer, both of Wrentham.

The Hood Rerailer Company, of Raleigh, N. C., has been formed to make an appliance invented by J. W. Hood for rerailing cars and engines. The incorporators are J. W. Hood, of Hamlet, N. C.; V. C. Tompkins and W. T. Younger, of Salem, W. Va., and others.

The Beard Automatic Coupler Company, organized to introduce the car coupler invented by Andrew Beard, of Birmingham, Ala., was incorporated with a capital of $100,000. J. H. Pritchard is President; Andrew J. Beard, Vice-President; F. W. Lowe, Secretary, and William R. King, Treasurer.

The Pneumatic Engineering Company of New York has received an order for a large air compressor for the water works of Sherman, Tex. It is a special Rand-Corliss compressor with Tangye frame, having air cylinders 20 and 12 x 20, and steam cylinders 9 and 17 x 20, designed for 200 lbs. per sq. in., air pressure.

The Wheeling Mould & Foundry Works, Wheeling, W. Va., has received a contract for one-half of the iron castings to be used in the Pennsylvania tunnel under the Hudson River between New York City and Jersey City amounting to about 32,000 tons. The other half has been ordered from the New York Car Wheel Co., of Buffalo.

The Butte County Railroad is putting in the following improvements at Chico, Cal.: A two-story brick machine shop, 200 ft. x 75 ft., with steel roof trusses and metal roofing, to be equipped with electrical traveling crane and all of the latest designed tools for repairing locomotives and cars, and repairing and building all kinds of machinery; a brick foundry, 135 ft. x 80 ft., with steel roof trusses and metal roofing equipped with electrical traveling crane and three Orbison oil burning furnaces; one for brass and two for cast-iron. This feature is entirely new for iron castings, but it is expected to produce a metal of the best quality; and a blacksmith shop, 75 ft. x 75 ft., of steel construction, metal roofing and siding, equipped with six fires, steam hammer, plate bending rolls, capacity ¾ in. plate 10 ft. 8 in. between housings.

Iron and Steel.

The Alabama Consolidated Coal and Iron Company, of Birmingham, Ala., will build another furnace at its Gadsden works.

The Ashland Steel Company is planning to increase its rod mill, which, at present, has a capacity of 250 tons a day, to bring the output up to 500 tons a day.

The Lackawanna Steel Co. will have its open-hearth steel plant in operation next month, and will enter the structural steel market with its product. Up to this time only rails have been made at this mill. A large new furnace will be put in operation at the same time.

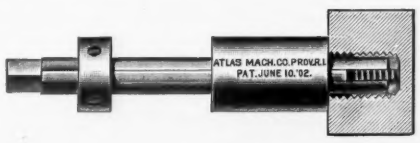
The I. C. Hirsch Iron, Steel & Rail Co. will have its permanent headquarters in Cincinnati, Ohio, and will build its works, to cover about 22 acres of land, at Hirschdale near Ivorydale. I. C. Hirsch, formerly of St. Louis, and W. B. Kahn, formerly President of the Atlas National Bank, are interested in the company.

C. P. R. Hotel at Winnipeg.

Contracts are soon to be let by the Canadian Pacific for a combination hotel and passenger station at Winnipeg which will be one of the finest buildings of its kind in America. There will 500 rooms in the hotel, which will be 240 ft. by 190 ft. The station will be 300 ft. by 150 ft., and the office portion 170 by 140. The hotel will be seven stories high, and will be on Main and Fonseca streets, and the offices on Maple street. The station waiting room will be two stories high, with a glass roof. The building will be largely of stone and terra cotta.

A Tool for Removing Broken Taps.

The accompanying illustration shows a handy device for removing broken taps when they break off in the hole which is being threaded. To use the tool, the end is



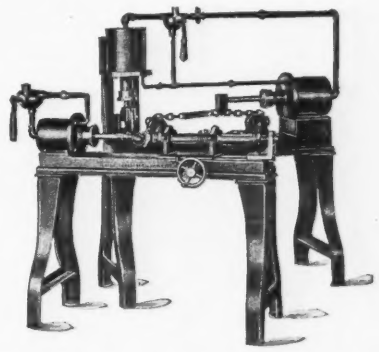
placed into the tapped hole, the three fingers of the abstractor are pushed down into the grooves of the tap by means of the outer collar, the sleeve is then slid down close to the work, and the broken tap is screwed out by placing a wrench on the squared end of the tool. The tool is made by the Atlas Machine Co., Providence, R. I.

Locomotive Tests at St. Louis.

A meeting of the advisory committee for locomotive testing, with officials of the Pennsylvania, was held at the testing plant in the Transportation Building of the World's Fair Grounds, St. Louis, on Wednesday, May 11th. There were present: W. F. M. Goss, representing the American Society of Mechanical Engineers; F. H. Clark and C. H. Quereau, representing the Master Mechanics' Association, and Willard A. Smith, representing the Exposition. The committee was met by F. D. Casanave, E. D. Nelson and George L. Wall, representing the Pennsylvania. They found the plant completely installed, having mounted upon it a P. R. R. 2-8-0 locomotive (H6a) having 56 in. drivers and 22 in. x 28 in. cylinders, all in full operation. The committee made a review of Bulletin No. 3, dealing with the procedure to be followed in conducting tests, and spent some time in inspecting the working of the plant. The final manuscript for Bulletin No. 3 was approved. The inspection of the plant revealed the extent of the undertaking of the railroad company in establishing a complete working laboratory, capable of handling in a scientific manner the great variety of problems which are involved by and are accessory to the testing of modern locomotives at the rate of two a month. While the plant is not yet in thorough working order, it is in service and the entire working staff of 27 men is on duty. It is expected that the formal work of the plant will begin in a few days, and that it will thereafter proceed regularly.

Machine for Repairing Air Hose.

The accompanying illustration shows a machine for cutting, stripping and splicing air and steam hose. It is claimed that with this machine one man can cut and strip 1,000 hose in 10 hours. Two machines, one for



cutting and stripping and another for splicing, have been in use for over three years at the shops of the Buffalo, Rochester & Pittsburg. It is claimed that the machines have saved 75 per cent. in labor over the old method of repairing hose by hand and that one dollar is saved on every two pieces of old hose which these machines make it possible to utilize. The Buckner & Carr Manufacturing Company, Rochester, N. Y., make these machines.

A 300-Ton Testing Machine.

Riehle Bros. Testing Machine Co., Philadelphia, Pa., has received an order to make for the University of Illinois a vertical screw power testing machine of 600,000 lbs. capacity. It will be the largest testing machine of this type ever built. It will be designed for the widest range of testing by tensile, transverse, and compression strains; and will take in tensile specimens 22 ft. long allowing for 20 per cent. elongation; transverse specimens 10 ft. long; and compression specimens 25 ft. long. The machine will stand 30 ft. high above floor line, will be 17 ft. long, and 11 ft. wide; it will weigh about 50 tons, and be operated by a 3-phase induction motor at 220 volts. There will be five speeds for testing and one rapid speed for setting a head. The weighing beam is the latest type of the Riehle dial screw beam. Two poises are used; the forward poise can be run out till it registers 300,000 lbs., when it will automatically release itself; then the other poise can be thrown in and run out, or both poises can be run out together. All the weight is registered on the weighing beam and no loose weights are required. This company also recently delivered to the same institution a 100,000 lb. testing machine; and has furnished the Simplex Railway Appliance Co., Hammond, Ind., a 300,000 lb. car bolster testing machine, a 100,000 lb. spring tester, and a 75,000 lb. closing press; Lafayette College, Easton, Pa., with a 200,000 lb. testing machine and torsional machine; and the Philadelphia Veneer & Lumber Co. with two Smith veneer cutting machines.

The Electric Headlight as a Safety Appliance.

At the May meeting of the Western Railway Club J. A. Carney, Master Mechanic of the Chicago, Burlington & Quincy, read a paper discussing the uses and weak points of the electric headlight. He considered that its value was almost without estimate as a warning to the public who have occasion to cross the right of way at grade, and cited an instance where a railroad running a night train through a prairie State had been able to stop entirely the crossing accidents, which were formerly prevalent, by the use of an electric headlight on the locomotive. The author considered that high speed trains equipped with electric headlights were remarkably free from crossing accidents after dark. On the other side of the question, he said that an electric headlight burn-

ing in a switching yard was a nuisance, as it almost obliterates the hand lanterns and switch lights that come in its field, so that at many division points it is the rule to shut down the light while the engine is waiting for its train. Another difficulty mentioned was the effect of the diverging rays of light from an electric headlight during snow, rain or mist. The electric headlight does the most harm under conditions when rain, snow and fog exist so as not to obscure signals at safe distances. The diverging rays light up the particles of rain, snow, or mist and produce a curtain of light which it is almost impossible to see through. The author considers it important to have electric headlights fitted with a circular extension to the case about 15 in. long, cutting down the angle of the direct rays from 78 deg. to 40 deg. in drawings which he showed. The improved headlight, which is in service, gives a sharper pencil of light, illuminates the track better, and is less objectionable under the conditions of light, rain, snow, or mist described.

Pig Iron Production for April.

The monthly statement of pig iron production as reported in last week's issue of the *Iron Age* shows that the production of anthracite and coke pig iron is still increasing at a moderate rate. The total production for April was 1,553,706 tons, as against 1,447,065 tons in March, 1,205,449 tons in February, and 921,231 tons in January of this year. The production during April compares quite favorably with the production recorded during the months of August and September, 1903, which was 1,614,128 tons and 1,596,703 tons respectively. The returns from the various producers show that the largest gains were made in the Shenango and Mahoning valleys and the Pittsburg, Wheeling and Chicago districts. The rapid resumption of work is indicated by a large increase in the number of furnaces in blast. The furnace capacity per week on May 1, 1904, was 367,355 tons, as compared with 337,257 tons on April 1, 308,751 tons on March 1 and 185,636 tons on January 1, 1904. Returns from the various plants of the United States Steel Corporation show that the production of pig iron in April was 974,006 tons, as compared with 913,412 tons in March, 756,230 tons in February, 502,994 tons in January and only 406,730 tons in December. This is almost equal to the months of June and July, 1903, when the production was 1,037,325 tons and 1,021,839 tons respectively. The number of stacks in blast on May 1 was 230. Notwithstanding an increase in the output of the merchant furnaces, the amount of stocks sold and unsold on May 1 show a decrease over the previous month from 457,913 tons to 444,059 tons. This slight reduction in stocks occurred in the Central West and Northwest, the accumulation remaining steady in the East.

In connection with this report, it is interesting to note the export figures of iron and steel for March. During this month, the following exports of iron and steel commodities were made: Steel billets, ingots and blooms, 36,908 tons; steel rails, 17,873 tons; steel wire rods, 3,399 tons; hoop, band and scroll, 577 tons, and steel sheets and plates, 3,051 tons. All these figures show large increases over the corresponding figures for February, which were: Steel billets, ingots and blooms, 26,205 tons; steel rails, 8,465 tons; steel wire rods, 570 tons; hoop, band and scroll, 440 tons, and steel sheets and plates, 905 tons.

Sundry Civil Appropriations.

The Sundry Civil Appropriation Act, approved on April 28, carries appropriations for the continuation of work on over 110 post-offices, custom-houses and government buildings in different parts of the country; and $1,500,000 for the construction and enlargement of buildings at military posts.

Appropriations are made for continuing improvements of river and harbor works on 35 projects previously authorized, among the larger of which are: For Bay Ridge and Red Hook Channels, New York, $175,000; Lake Erie entrance to Black Rock Harbor and Erie Basin, New York, $125,000; for widening and deepening channels, Boston, Mass., harbor, $350,000; continuing construction of breakwater, San Pedro, Cal., $350,000; new harbor entrance and breakwater extension, Cleveland, Ohio, $460,000; harbor, Conneaut, Ohio, $240,000; Delaware River, from Philadelphia to Delaware Bay, $1,000,000; continuing construction of locks and dams in the Tombigbee and Warrior rivers, Alabama, $225,000; Galveston ship channel and Buffalo Bayou, Texas, $200,000; Mississippi River from the mouth of the Ohio River to the mouth of the Missouri River, $650,000; and from the mouth of the Missouri River to St. Paul, Minn., $400,000. Under the Mississippi River Commission for the improvement of the Mississippi River from the Head of the Passes to the mouth of the Ohio River, including salaries, office, traveling and miscellaneous expenses $2,000,000 is appropriated.

For the Interstate Commerce Commission, including salaries, employment of counsel, books, printing and other necessary expenditures, $290,000 is appropriated. And to enable the Commission to keep informed regarding compliance with the safety appliance law, $65,000 additional.

For field expenses of the Coast and Geodetic Survey, $264,900.

For the Geological Survey, $1,087,920.

Under the Department of State $400 is appropriated for the participation of the United States in the International Railway Congress, to be held in Washington in May, 1905.

The Superintendent of the Capitol Building and Grounds is authorized to make contracts for a building for a heating, lighting and electric power plant of sufficient size and capacity to supply heat, light and power for the Capitol building, the library of Congress, the office building for the House of Representatives and such other public buildings as may hereafter be built adjacent to the Capitol grounds. The total cost of the building, machinery and equipment, including the necessary subways and tunnels, is not to exceed $757,800, of which $130,000 is appropriated.

A commission composed of Senators Cullom, Gallinger and Cockrell, is created to acquire a site northeast of and adjoining the Capitol grounds, and to build thereon a fireproof building for committee rooms, folding room and office rooms for Senators, the plans for the building to be secured by the commission in any way they may deem advisable. For the site, $750,000 is appropriated and the total cost of the building, exclusive of the site, shall not exceed $2,250,000. The letting of contracts and construction of the building shall be under the direction of the Superintendent of the Capitol Building and Grounds, subject to the supervision of the commission. It is expected that the building will harmonize architecturally with the office building for the House of Representatives on the opposite side of the Capitol grounds.

The joint commission to consider the enlargement of the Capitol has approved the Walter plan of 1865, which provides for extending the central portion, under the dome only, of the Capitol building on the east as far as the Senate and House wings extend in that direction, and Messrs. Carrere & Hastings, of Boston, have been authorized to go over the plan, and report as soon as possible what, if any, changes in it should be made.

THE SCRAP HEAP.

Notes.

The Southern Pacific passenger department reports that 23,904 homeseekers arrived in California during the months of March and April, an increase of 3,000 over last year.

According to the Des Moines *Capital* the Railroad Commission of Iowa has notified the railroads that between competing points the longest line may reduce its passenger fare to a sum equal to the authorized rate by the shortest line.

The Canadian Pacific elevator "B" at Fort William, Ont., valued at $250,000, with its contents of 300,000 bushels of wheat, was destroyed by fire May 12. This elevator had a capacity of 1,250,000 bushels, and its loss will cripple business at Fort William.

As a result of the retrenchment order recently issued on the New York Central, half of the block stations on the West Shore are henceforth to be closed during the night. According to the Utica *Herald* this makes the length of the block sections from three to six miles.

The railroads in Louisiana have adopted the uniform bill of lading which the State Railroad Commission recommended, but have notified the Commission that they do not intend this action to be taken as an acknowledgment of the right of the Commission to prescribe a form.

The Railway Commissioners of Canada have decided that they will not issue a general freight tariff until November. The law under which the commission was organized stipulated that a freight tariff should be prepared and issued within three months (which term expires May 1) unless the commissioners should vote to postpone the date. The commissioners have already approved certain detail changes in freight rates.

The Poughkeepsie Bridge.

President Mellen, of the New York, New Haven & Hartford, says that a careful examination of the Poughkeepsie bridge by an expert, extending over the last two months, shows that, with some minor and not very expensive repairs, the structure will sustain any traffic which his company is likely to put upon it.

The Manufacturers' Advertising Club of Cleveland.

The Manufacturers' Advertising Club of Cleveland, Ohio, was organized on March 8, 1904, its membership being composed of the advertising managers of various manufacturing industries of Cleveland. Only persons actively engaged in the advertising business, connected with industries of Cleveland and vicinity, are eligible for membership. The admission fee is $5 and the annual dues $12. Meetings are held on the second Tuesday in each month.

The Kind we see in Story Books.

A press despatch from Albany, Ga., May 3 says: A frightful accident was narrowly averted shortly before noon to-day, when southbound passenger train No. 72, on the Atlantic Coast Line, dashed into a Central of Georgia freight, which was moving over the Coast Line bridge over Flint river. The two engines met at a point where the trestle is fully 50 ft. above the ground; but they telescoped, and neither was thrown from the trestle, and the passenger coaches were not knocked off the track. There was a momentary panic among the passengers, a curve in the trestle making it an easy matter to witness the collision from the coach windows.

A Sand Blizzard on the Rock Island.

On the El Paso division of the Rock Island between Bucklin, Kan., and Tucumcari, N. Mex., on April 24th, one of the most severe sand blizzards in the history of that part of the country occurred. All traffic on the railroad had to be abandoned. The wind cut the sand out of some of the embankments to such an extent that they had to be filled up again before trains could pass over them; while at other points the sand drifted several feet deep over the track. The storm was responsible for a peculiar and unusual accident. Lightning struck a car standing on a coal wharf track, tearing the brakes loose, following which the wind blew the car over the end of the track.

New Train Service to Duluth by the North Western.

The Chicago & North Western inaugurated on Sunday, May 1, a new train service between Chicago and Duluth, Minn. The train is called the "Chicago-Duluth Limited," and is composed of all-new equipment, provided throughout with electric lights, including individual reading lamps in the sleeping-car berths and the library car. The trains run through solid between the two cities, leaving Chicago at 10 p.m. and arriving at Duluth at 10.45 a.m. Returning, leave Duluth at 5.20 p.m., arrive Chicago 7.30 a.m. The trains have dining car service. This train service is especially convenient for persons wishing to visit the region of famous fishing and hunting resorts in eastern Wisconsin.

Furnishing Coal Cars Equitably.

The Interstate Commerce Commission in an opinion by Chairman Knapp has announced its decision in the case of the Glade Coal Company, of Meyersdale, Pa., against the Baltimore & Ohio. The decision says that defendant's refusal to furnish cars to complainants between Feb. 25 and March 26 on the Deal side-track at Meyersdale and the side-track of the Savage Fire Brick Company at Keystone Junction, while furnishing and offering to furnish cars to complainants' competitors at other points, under the circumstances disclosed by the evidence and described in the findings, was undue and unlawful discrimination against complainants, for which they are entitled to reparation. Making certain charges for the transportation of coal shipped in carloads when the coal is loaded by tipple, and exacting a higher charge when it is loaded in some other way, *and for that reason*, is not justified by difference in cost to the carrier between different methods of loading, or by other facts appearing in this case, and renders the higher rates thus made unreasonable and unduly discriminatory, first, as against complainants, and, second, as against all other shippers of coal except those who load by tipple, and constitute a violation of sections 1 and 3 of the Act to regulate commerce.

Cars Wanted in Siam.

A consular report from Bangkok, Siam, says that tenders are now being asked for 187 cars and accessories for the Royal Siamese State Railroads. The specifications call for the use of teak exclusively for the woodwork of the cars, which would practically exclude the possibility of American competition, but the consul suggests that some other kind of durable wood could undoubtedly be substituted by arrangement with the Siamese government. The report, obtainable from the Department of Commerce and Labor, prints in full the specifications, which are too voluminous to be reproduced here. The consul suggests that it would be greatly to the advantage of the successful competitor to charter a ship of not more than 12-ft. draft, and send the order direct to Bangkok. In this way, the heavy freight charges from Singapore could be avoided, as well as the cost of lighterage from the bar to Bangkok. As the freight rate from Singapore is not fixed, it would probably be greater on this particular order than the present rate of $1.75 gold per ton of 40 cu. ft., and to this also must be added the lighterage from the bar to Bangkok, at $1.50 to $1.75 gold, plus the variable and unknown cost of transshipment at Singapore. The probable cost by regular transportation routes would be from $4 to $4.50 per ton of 40 cu. ft.

Crop Conditions on May 1, 1904.

Returns to the Chief of the Bureau of Statistics of the Department of Agriculture made up to May 1 show the area under winter wheat in cultivation on that date to have been about 27,083,500 acres. This is 4,932,700 acres, or 15.4 per cent., less than the area sown last fall and 5,427,000 acres, or 16.7 per cent., less than the area of winter wheat harvested last year. Of this abandonment Indiana reports 904,000, Kansas 713,000, Ohio 475,000, California (mainly the usual cutting for hay) 391,000, Oklahoma 373,000, Texas 299,000, Illinois 269,000, Michigan 259,000, Nebraska 218,000, and Pennsylvania, Kentucky, and Missouri each between 100,000 and 200,000 acres. It is a noteworthy fact that the whole of the 31 States having more or less winter wheat under cultivation report some abandonment of acreage.

For the 27,083,500 acres remaining under cultivation the average condition on May 1 was 76.5, which is identical with that reported on April 1 for the entire acreage sown. The general condition averages reported on May 1, 1903, and May 1, 1902, were respectively 92.6 and 76.4, the mean of the May averages of the last 10 years being 84.2.

The average condition of winter rye on May 1 was

81.2, as compared with 82.3 on April 1, 1904; 93.3 on May 1, 1903; 83.4 at the corresponding date in 1902, and 89.5 the mean of the May averages of the last 10 years.

The average condition of meadow mowing lands on May 1 was 85, against 92.8 on May 1, 1903; 86.6 at the corresponding date in 1902, and 90.7 the mean of the May averages of the last 10 years.

The average condition of spring pastures on May 1 was 80.5, against 92 on May 1, 1903; 84.9 at the corresponding date in 1902, and 90.3 the mean of the May averages of the last 10 years.

Of the total acreage of spring plowing contemplated, 57.3 per cent. is reported as actually done up to May 1, as compared with 57.9 per cent. at the corresponding date last year and a 10-year average on May 1 of 70.3.

The available records of the Department show for no preceding year such uniformity of unfavorable conditions as is reported this month.

Proposed Riga-Cherson Canal.

A plan to connect northern Russia with southern Russia by a canal for ships of heavy draft, starting from Riga, a port on the Baltic Sea, and ending at Cherson, a port on the Black Sea, has recently been worked out by the Russian engineer, W. von Ruckteschell.

The prominent rivers of European Russia can be divided into two groups, the northern and the southern. The most important river system of the northwest, which empties into the Baltic Sea, is the Western Dvina, and the important river system of southwestern Russia is the Dnieper. By connecting these two systems through a deep canal a passage for ships of heavy draft would be opened and a continuous water way established from the Baltic to the Black Sea. A careful study of this question has proved the possibility of building this canal without locks, a circumstance of enormous significance to warships and all vessels of heavy draft. As regards trade, this canal should be of great importance, because the commercial fleet of the Baltic Sea, which is now obliged to sail around Europe, to reach the ports of the Black and Azof seas, could pass to these ports by way of the canal, occupying about as many days as it now takes weeks. At present it takes a steamer going from St. Petersburg to Odessa about six weeks, whereas by passing through the proposed canal the time would be reduced to 12 days, the steamer making three voyages by canal instead of one as at present. The saving in time, coal, labor and, lastly, the safety of the canal trip, would naturally induce ships going from northern Europe via the Suez Canal to the East, as well as those returning from the East to northern Europe, to choose this line. Hence, it is reasonable to suppose that the transportation of freight between northern Europe and Asia, amounting yearly to several millions of tons, would be attracted to the canal, if it can be built. The great change that would be realized in commercial relations with the East can only be compared by the change that took place by the opening of the Suez Canal.

The total projected length of the canal is 1,468 miles, as follows: The western Dvina river, 330 miles; the canal between the Dvina and Dnieper rivers, about 66 miles; and the Dnieper river proper, 1,072 miles. The projected depth of the canal is 31½ ft.; width of bottom of canal, 140 ft.; width on surface, 266 ft. The total cost is estimated at about $180,250,000.—*Consular Report.*

Double Wages on Pushing Engines.

The railroads in the west have generally been forced to agree to a very arbitrary ruling of the locomotive engineers, which is that the locomotive helper mileage at no time shall exceed 2½ per cent. of the total freight engine mileage; for any excess over this percentage, the locomotive engineer and fireman shall receive double pay. The special contribution to the science of railroading by Mr. Wellington, whose book has been the study and the despair of progressive railroad managers, was the demonstrated saving to be effected by the judicious use of helper locomotives over a territory of uneven topography. The limitation placed upon the use of the locomotive which may some time in the future force it to yield place to electricity is the inflexibility of the unit of power. By the judicious use of helpers, much economy has been effected. The assumptions of the civil engineer have been the stability of the ordinary laws of gravity, friction, etc. Among these natural laws he has also assumed a standard wage for a standard day's service, regardless of the purpose in the general plan to which the standard day's service would be applied.

The locomotive engineers have another purpose to serve than the delivery of the standard day's service at the standard wage. They realize that the purpose of the helper engine is to increase the efficiency of all the power employed upon the road, and thereby to decrease the amount of power to handle a given tonnage. To reduce the amount of power to handle a given tonnage, they reason, is to reduce the number of locomotive engineers who will handle that tonnage, and therefore they seek to penalize the use of helper engines by charging double pay for their time employed in running them.

The 2½ per cent. must be construed to be a concession to the Grand Engineer who was so short-sighted in those geologic periods when the earth's crust was forming as not to realize the requirements which the locomotive engineers would impose in these latter days. This demand is a flagrant instance of the ill-advised restrictions placed at times by organized labor. It is not in the interest of efficiency of the road, nor is it a protection to life, or to reduce the strain, or to ease the service of the engineer; it restricts the natural economical operation of the property, thereby imposing an added cost to every ton of freight moved over such road. Trade has at all times suffered from such trammels, and doubtless must continue to suffer. The laboring man has learned his methods, in a large degree, from the companies for which he has worked. They, too, employ the restrictive principle of limiting output and controlling price.—*Wall Street Journal.*

Italian Railroads.

Although Italy has done much in the last 30 years for the upbuilding of her railroad system, that branch of transportation is still very deficient, especially in the southern Provinces. The railroads in Italy are divided into three divisions: The Adriatic, or Southern, covering the eastern side of the Apennines; the Mediterranean, on the western side; and the Sicilian. There is also a small railroad system in Sardinia. The Mediterranean covers, in the aggregate 3,616 miles, the Adriatic, 3,600 miles; the Sicilian, 681 miles; other secondary steam and electric tramway lines, 1,944 miles. Italy has tried several methods in operating her railroads. Up to 1865 the Government either built the roads or granted concessions for building them. The prevailing opinion was that the railroads should be run directly by the Government and even the lines conceded to private concerns were operated by the State, the construction companies receiving for their share 50 per cent. of the gross earnings. In 1865 the system was changed; concessions were given in toto to private concerns, and, owing to financial necessities, all the railroads owned by the Government were sold. In 1868 the railroads were redeemed by the Government, leaving, however, their operation to private companies. In 1885 again, in spite of the lively opposition in Parliament, the Government abandoned the redemption of the Southern Railroad, still the property of a private company, and turned over the operating to three large companies, the Mediterranean, the Adriatic or Southern, and the Sicilian. These contracts expire in 1905. At present the railroad question is being thoroughly discussed. A large part of the country advocates operation by the Government, while others prefer the continuance of the leases to the private concerns. There is, however, only one opinion as to the necessity of greatly improving the system, whether by the Government or by private companies, in order that the country may obtain a better service. The union of the Chamber of Commerce is opposed to the Government operating the railroads, but it demands that the present situation be changed and improved. On the other hand, there is a strong current in favor of operating the railroads by the State. The matter is now being thoroughly examined by Parliament. Railroad tariffs for passengers, as well as freight, are very high, there being no competition. The law prohibits the building of parallel lines. The object of the high tariff is to compensate the northern lines for the deficit of the lines in the south. Another reason is to secure a larger revenue to the Government out of the railroad earnings, in order that it may meet the interest on the debt contracted for building and redemption. It is not yet realized in Italy that the cheaper the means of transportation the greater the traffic and, consequently, the greater the revenue. It is true that under the existing circumstances traffic cannot be much increased, especially in northern Italy, where the railroads are taxed to their utmost capacity.—*Consular Report.*

Opportunities for American Bridge Builders.

A consular report from Harput says that two projected bridges over the Euphrates, a short distance from Harput, offer distinct opportunities for American bridge builders. Bridges of modern construction are totally unknown throughout this section. The few existing bridges are either arches of masonry or wooden roadways resting on stone piers, placed at short distances apart. There are a few bridges of some length, as at Sivas over the Kizil Irmak and at Diarbekr over the Tigris, dating back many centuries and consisting of successive narrow arches of masonry. The location of the first of these bridges is about 12 miles north of Harput over the Murad Su, or eastern branch of the Euhprates, near Perteg. It is at the point where the Romans constructed a bridge which formed an important link in the military road leading north from Harput across the Dersim Mountains to Erzinjan. The entire region about Perteg is a basalt formation. The Roman engineers very carefully selected a spot where two islets of basalt in the stream formed convenient natural piers. The large, well-cut blocks of sandstone employed in their piers of masonry are still scattered over the larger of the two islets, while remains of the abutment on the opposite north shore of the river are also visible.

The distance from this island to the north shore is 75 ft., while the distances from the larger island to the smaller and from the smaller to the south shore are not over 40 ft. each. This bridge will be built at the expense of the vilayet of Perteg. The construction has been authorized and a commission appointed to have charge of the work. No regular survey has yet been made, but it will shortly be begun. All masonry work will be done by separate contract. The commission desires to have plans of the simplest types of iron bridge desirable for such a location as that described. Some of the conditions are as follows: Sufficient width for two ordinary-sized vehicles. Loadings sufficient for the passage of heavy field artillery. The construction should be as simple as possible, permitting the material to be easily put together at this point, without the need of an engineer from abroad. No piece should exceed 1,425 lbs. in weight, owing to the difficulty of transportation from the seacoast to this point. On account of cost of overland transportation the total weight should be reduced to a minimum. It is desired, not only for the three sections of the proposed bridge at Perteg, but also for other projected bridges in this vilayet, to have on file at this consulate blue prints or designs of simple types, conforming to the above requirements, of the lengths from 30 up to 100 ft., with specifications as to the total weight, and prices f. o. b. New York, with conditions of payment. The location of the other projected bridge is over the Euphrates at Kemur Khan, the half-way point on the post route between Bagdad and Constantinople. It is the one place on this route where serious interruptions to the passage of the mails and to general traffic frequently occur in winter, as a crude ferryboat is the only means of crossing the river. At Kemur Khan the Euphrates enters the grand canyon, passing for about 40 miles through the Taurus chain. At the entrance of the great gorge the river is narrowed and there are several points varying in width from 275 to 300 ft., well adapted for bridge location. The Minister of Public Works has authorized the construction of this long-needed link between the capital and the metropolis of Mesopotamia. The expense is to be divided among the five vilayets along the route, viz., Sivas, Mamouret-ul-Aziz, Diarbekr, Mosul, and Bagdad. The governor-general has requested plans and specifications, with estimate of cost. This estimate should include (1) price of material, f. o. b. Samsoun, and (2) cost of erection, exclusive of necessary masonry. Plans should provide for one structure resting upon, or depending upon, piers 275 ft. apart in the clear, and for another structure with piers 300 ft. apart—*i. e.*, the necessary lengths at each end resting upon piers, or the additional lengths involved in cantilever construction should be added to the above figures. It is important for the authorities here to have plans and approximate estimates at an early date, so that they may come to a decision with regard to style of structure and provide for the cost.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page 16.)

Engineers' Club of Philadelphia.

At the meeting to be held May 21, papers will be presented on Recent Sewer Construction in Philadelphia, by C. H. Ott, and Individual Operation of Machine Tools by Electric Motors, by Charles Day.

American Society of Civil Engineers.

At a meeting of this society held in New York May 14, papers were presented on "The Gatun Dam," by C. D. Ward, and "The Collapse of a Building During Construction," by H. D. B. Parsons. Both of these papers were printed in the April number of the proceedings.

Western Railway Club.

At the meeting of this club in Chicago May 17, the following officers were elected: President, L. G. Parish (L. S. & M. S.); First Vice-President, J. A. Carney (C., B. & Q.); Second Vice-President, H. T. Bentley (C. & N. W.); Treasurer, P. H. Peck (C. & W. I.); Directors, M. K. Barnum, C. A. Seley and C. B. Young; Library Trustees, C. A. Seley, W. F. M. Goss and F. W. Sargent.

American Society for Testing Materials.

The seventh annual meeting of this society will be held at Atlantic City, N. J., on June 16, 17 and 18. The headquarters will be at the Hotel Traymore, where special rates have been obtained. An elaborate programme will soon be issued. Members wishing to contribute papers who have not yet notified the secretary, are requested to do so without delay. The Nominating Committee has named the following candidates for the ensuing term (1904 to 1906): For President, Charles B. Dudley; for Vice-President, R. W. Lesley; for Secretary-Treasurer, Edgar Marburg; for member of the Executive Committee, James Christie.

American Society of Mechanical Engineers and the Institution of Mechanical Engineers.

For the joint meeting of these societies to be held in Chicago, May 31 to June 3, the headquarters will be at the Auditorium Hotel. The papers to be read are: "The Wages Problem," by H. Emerson; "Recent Examples of Destructors for Town Refuse," by G. Watson; "Refuse Destruction by Burning and the Utilization of Heat Generated," by N. C. Russell; "Steam Turbine Work," by F. Hodgkinson; "The De Laval Steam Turbine," by Messrs. E. S. Lee and E. Meden; "The Curtis Steam Turbine," by W. L. R. Emmet; "Different Applications of Steam Turbines," by A. Rateau; "The Potential Efficiency of Prime Movers," by C. V. Kerr; "Power Plant of the Tall Office Building," by J. H. Wells; the same subject, by R. P. Bolton; "Middlesbrough Dock Electric and Hydraulic Power Plant," by V. L. Raven; "Use of

Superheated Steam and of Reheaters in Compound Engines of Large Size," by L. S. Marks; "Commercial Gas Engine Testing and Proposed Standard of Comparison," by William P. Flint; "Cast Iron Specifications," by William J. Keep; "Effects of Strain of Annealing," by William Campbell; "Lathe-Tool Dynamotor," by J. T. Nicholson; "Road Test of Consolidation Freight Locomotives," by E. A. Hitchcock; "Locomotive Testing Plant," by W. F. M. Goss. A paper will also be offered on "Notes on Testing Locomotives." The usual arrangements have been made for reduced railroad fares on the certificate plan. In the course of the four days the members and friends will visit the Field Columbian Museum, the South Chicago Works of the Illinois Steel Co., the Fisk street station of the Commonwealth Electric Co. and the parks. The local members have also arranged an exhibition at the Art Institute for June 2, and a special concert by the Thomas Orchestra at the Auditorium Theatre June 3.

PERSONAL.

—Col. Edward L. Whitford, for many years General Freight Agent of the Concord (New Hampshire) Railroad, died at his home in Washington, D. C., on May 11, at the age of 68.

—Mr. Frank N. Rouse, General Freight Agent of the Old Dominion Steamship Line, died on May 11, of Bright's disease, at the age of 30. When a boy Mr. Rouse worked for the Chesapeake & Ohio, and about three years ago went to the Old Dominion Line as chief clerk, later being appointed to the position he held at the time of his death.

—Mr. George A. Bergen, who has been appointed Assistant General Freight Agent in charge of coal and coke traffic east of Buffalo and Salamanca on the Erie Railroad, has been in the service of that company for the past 16 years. He began as an office boy for G. H. Valliant, Freight Traffic Manager, in 1888, and about eight months later was made a clerk in the coal freight office. In 1893 he was made chief clerk to the Coal Freight Agent.

—Mr. James A. Hinson, President of the National Car Coupler Company of Chicago, and a well known inventor of car coupling devices, died suddenly of appendicitis on May 12. Mr. Hinson had been ill but two days. He was born at Moorehead City, N. C., 52 years ago, and when a young man moved to Iowa. He had been in Chicago about 12 years, but the whole of his active life had been in the railroad supply business. One of Mr. Hinson's most important inventions was the National combination coupler to couple with the Miller hook. He also invented a centering device and a friction draft rigging.

—Mr. Barton Flinn Dickson, who until about three months ago was General Superintendent of the Kansas City Southern, died recently in Kansas City, at the age of 45. Mr. Dickson was born in Orangeburg, S. C., and was educated at the University of Alabama. His first railroad work was in 1881 as a levelman for the Texas Mexican. The next year he went to the Texas Western. For a few months he was President of the Tuscaloosa Street Railway. In 1884 he went to the Louisville & Nashville, and in 1886 was made General Land Agent and Principal Assistant Engineer; in 1889 Assistant Superintendent, and in 1890 Division Superintendent.

—Mr. J. E. Mechling, Master Mechanic at Terre Haute, Ind., of the Vandalia Line, was born at Butler, Pa., in 1863. After receiving a public school education he entered the shops of the H. K. Porter Locomotive Works of Pittsburg, and remained with that company until 1882, when he entered the Pittsburg shops of the Pennsylvania Railroad. In 1883 he went west and took a position on the Chicago, Milwaukee & St. Paul at West Milwaukee, but later was transferred to Wells, Minn. Three years later he resigned and returned to Pittsburg as machinist for the Pennsylvania, was promoted to be gang foreman of the erecting shop in 1886; roundhouse foreman at Wall, Pa., in 1892; Assistant Master Mechanic of the Pittsburg Division in 1902, and now goes to the Vandalia Line at Terre Haute.

—Mr. Jacob N. Barr, Assistant to the President of the Chicago, Milwaukee & St. Paul, died recently at his home in Libertyville, Ill. Mr. Barr had been in ill health for some time and quite recently was granted a few months' leave of absence. Mr. Barr was about 52 years old. He was a graduate of Lehigh University, and his railroad work began early in life. He was for some time in the Pennsylvania shops at Altoona. In 1886, after several years as Superintendent of the car department of the St. Paul, he was made Superintendent of Motive Power. After three years in this position he resigned and went to the Baltimore & Ohio as Mechanical Superintendent. Later he took a similar position on the Erie, but not long after this he returned to the St. Paul as General Superintendent. About a year ago he was appointed Assistant to the President of this company. Mr. Barr had produced many useful devices now in use in railroad shops and he was the inventor of the contracting chill process for casting car wheels.

—Mr. E. H. McHenry, the new Fourth Vice-President of the New York, New Haven & Hartford, has for about two years past been Chief Engineer of the Canadian Pacific. He was born in Cincinnati, Ohio, 45 years ago, and took a scientific course at the Pennsylvania Military Academy at Chester, Pa., now the Pennsylvania Military College. Mr. McHenry's railroad career dates from 1883, when he entered the service of the Northern Pacific; and he served with that company in various subordinate engineering positions for a number of years. In the spring of 1885 he was on the James River Valley road, which was bought and finished by the Northern Pacific. Then for a short time he was on the Minnesota & North Western, but resigned in 1886, and went back to the Northern Pacific, and was continuously with that company until September, 1901. While there he passed through all the grades from chainman to Chief Engineer, and was one of the Receivers before the reorganization of the company in 1896. Shortly after his resignation as Chief Engineer of the Northern Pacific, Mr. McHenry took a trip to the Far East, and upon his return was made Chief Engineer of the Canadian Pacific, which position he now leaves to go to the New Haven road.

—Mr. William Francis Tye, who succeeds Mr. McHenry as Chief Engineer of the Canadian Pacific, is about 43 years old. Mr. Tye was educated at Ottawa University, and at the School of Practical Science, Toronto (1878 to 1881), and entered railroad service in 1882. From then until 1885, he served successively as rodman, leveler, transitman on location, and afterwards as assistant engineer on construction of the Canadian Pacific. During 1886 and 1887 he was transitman and assistant engineer on the St. Paul, Minneapolis & Manitoba. The next year he served as Engineer of Track and Bridges on the Tampico branch of the Mexican Central. In 1890 he was locating Engineer of the Great Falls & Canada Railway in Montana, and in 1891 and 1892 Engineer in charge of location and Division Engineer of the Pacific extension of the Great Northern. For about two years he was in the west as Engineer in charge of the change of gage of the Alberta Railway & Coal Company's road. In 1895 he was Chief Engineer of the Kaslo & Slocan Railway, and for four years following 1896, he held a similar position on the Columbia & Western. In 1900 Mr. Tye became Chief Engineer of Construction of the Canadian Pacific, and in June, 1902, was appointed Assistant Chief Engineer of the system, which position he has since held.

ELECTIONS AND APPOINTMENTS.

Arkansas & Louisiana.—See Arkansas Central.

Arkansas Central.—J. H. Wright has been elected President and Treasurer of this company and General Freight and Passenger Agent of the Arkansas & Louisiana, with headquarters at Washington, Ark., succeeding C. E. Ratcliff, resigned.

Canadian Pacific.—William F. Tye, hitherto Assistant Chief Engineer, has been appointed Chief Engineer, with headquarters at Montreal, succeeding E. H. McHenry, resigned. (See New York, New Haven & Hartford.)

Chicago, Rock Island & Pacific.—W. L. Harrison, Master Mechanic at North Little Rock, Ark., has resigned.

Fort Worth & Denver City.—O. J. Travis has been appointed Superintendent of Bridges and Buildings and Water Service, and E. H. Jones, Resident Engineer, with headquarters at Fort Worth.

Great Northern.—Macy Nicholson has been appointed Assistant Superintendent of the Dakota Division, with headquarters at Larimore, N. Dak., succeeding R. A. McCandless, assigned to other duties. R. C. St. John has been appointed Assistant Superintendent of the Northern Division, with headquarters at Grand Forks, N. Dak., succeeding Mr. Nicholson.

John Dickson has been appointed Master Mechanic at Larimore, N. Dak.

Gulf, Colorado & Santa Fe.—L. J. Polk, Second Vice-President, has resigned.

Halifax & Yarmouth.—At the annual meeting held recently, G. Martin Brill was elected President, and G. W. B. Fletcher, Treasurer. Both have their offices at Philadelphia.

Illinois Central.—W. J. Harahan, hitherto Assistant General Manager, has been appointed General Manager, succeeding J. F. Wallace. I. G. Rawn, hitherto General Superintendent of Transportation, succeeds Mr. Harahan as Assistant General Manager, and Mr. Rawn in turn is succeeded by D. W. Ross. C. F. Parker, hitherto Coal Traffic Manager, has been appointed to succeed Mr. Ross as Purchasing Agent.

Louisville & Nashville.—E. A. De Funiak, General Agent at Birmingham, has been appointed General Freight Agent (lines south of Decatur, Ala.,) with office at Montgomery, Ala., succeeding F. C. Shepard, who has been assigned to other duties.

W. C. Houston has been appointed General Agent, with office in Knoxville, Tenn., succeeding S. H. Stout.

National of Mexico.—H. N. Gibson has been appointed General Agent, with office in the City of Monterey, Mexico.

New York, New Haven & Hartford.—It is announced that the position of Fourth Vice-President has been created, and that E. H. McHenry, recently of the Canadian Pacific, has been appointed to fill the position. The Fourth Vice-President will have supervision of construction, and will also represent that company in electric railroads in which it has an interest. The prospective electrification of the line into New York City is given as another reason which has led to the creation of this new office.

R. W. Taft has been elected a Director, succeeding his father, Royal C. Taft.

Pennsylvania Company.—G. Scott has been appointed Assistant Engineer at Wellsville, Ohio, succeeding R. C. Harris, promoted.

St. Louis & San Francisco.—C. E. Burr has been appointed Superintendent of the Southwestern Division, with headquarters at Sapulpa, Ind. T., succeeding S. L. Rainey.

B. W. Moore has been appointed Superintendent of Terminals in St. Louis, Mo.

St. Louis, Memphis & Southeastern.—G. W. Smith (Superintendent of Motive Power and Machinery of the Chicago & Eastern Illinois) has been appointed to a similar position on the St. L., M. & S. E.

San Pete Valley.—John W. Young, of Dublin, Ireland, has been elected President and General Manager, succeeding the late Mr. Bruback.

LOCOMOTIVE BUILDING.

The Central of Brazil is reported in the market for freight locomotives. The headquarters of the company are at Rio de Janeiro.

F. M. Hicks, of the Hicks Locomotive & Car Works, has sold the following equipment: Champion Construction Co., one 8-wheel locomotive; Blakely R. R., two 10-wheel locomotives; Green Bay & Western, one 8-wheel locomotive; W. E. Dorwin, one 8-wheel locomotive; F. A. Lawson & Co., one 18 in. x 24 in. 10-wheel locomotive; Lancaster & Chester, one 18 in. x 24 in. 10-wheel locomotive; J. E. North Lumber Co., one 18 in. x 22 in. 6-wheel switching engine; Pittsburg, Carnegie & Western, two 10-wheel locomotives; Russ Daniels, contractor, one Forney locomotive; Little Rock, Hot Springs & Western, one 52-ton 8-wheel locomotive; Pan-American R. R., one locomotive.

CAR BUILDING.

The Aurora, Elgin & Chicago will soon place an order for five cars.

The West Side Belt (Pittsburg) is in the market for 1,000 steel cars.

The Lake Shore & Michigan Southern will build 20 baggage cars at its own shops.

The Wabash, according to press reports, is in the market for from 1,000 to 2,000 cars.

The Pennsylvania Lines West, according to press reports, are in the market for a large number of cars.

The Northern Pacific has ordered four standard sleeping cars of twelve sections each from the Pullman Co.

The New York Central & Hudson River has ordered five buffet cars from the Pullman Co. The special equipment includes: Westinghouse air-brakes, Gould couplers, 6-wheel trucks and Paige wheels.

The Northern Pacific has ordered four 70-ft. passenger, four tourist and four 70-ft. mail and express cars from the Barney & Smith Car Co., for July delivery. The special equipment includes: steel axles, Diamond "S" brake-beams and brake-shoes, Westinghouse air-brakes, Chicago passenger type couplers, Forsythe curtain fixtures, Pantasote curtain material, Miner draft rigging, Gold duplex heating system, Northern Pacific standard paint, Standard Steel platforms, Barney & Smith seats, Railway Steel-Spring Co.'s springs, six-wheel trucks and Boise wheels.

F. M. Hicks, of the Hicks Locomotive & Car Works, has sold the following equipment: W. E. Dorwin, two box cars of 40,000 lbs. capacity, one combination coach and 10 flat cars of 50,000 lbs. capacity; Pittsburg, Carnegie & Western, 10 flat cars; Mr. Roy Leach, one private car; Pan-American R. R., three coaches and one combination car; Baltimore & Annapolis Short Line, one baggage car; Weed Lumber Co., 10 flat cars; Jonesboro, Lake City & Eastern, one passenger coach; Cincinnati, Georgetown & Portsmouth, six center-dump cars; Delaware, Susquehanna & Western, three side-dump cars.

BRIDGE BUILDING.

Alviston, Ont.—A. S. Code, C. E., is asking for bids for a steel bridge over English creek.

Anderson, Ind.—County Surveyor Downey is preparing plans for building new bridges in Madison County.

Ashwaubenon, Wis.—A stone and iron bridge will be built over Ashwaubenon Creek, on the Aerts roads, to replace the structure destroyed by floods.

Bath, N. Y.—The Delaware, Lackawanna & Western, it is reported, will build a bridge at Mount Morris 600 ft. long with five spans, of steel and concrete construction; also a bridge over the Chemung River 1,000 ft. long, with six spans, near Elmira, and a bridge 540 ft. long over the Chemung at Waverly.

Beaumont, Texas.—The Jefferson County Commissioners have authorized an issue of $20,000 of bonds to pay for a steel drawbridge over Taylor's Bayou near Port Arthur.

Bellows Falls, Vt.—There were six bids opened May 11 for the new bridge to be built over the Connecticut River, plans for which call for a single-span bridge without a pier in the river. The prices ranged from $49,950 to $60,000.

Blackfoot, Idaho.—The County Commissioners have under consideration the question of building a bridge over Snake River about four miles from this place.

Brantford, Ont.—A. E. Watts, County Clerk, wants bids for rebuilding the bridge over Grand river.

Cambridge, Ohio.—Bids are wanted May 26 by Guernsey County Commissioners for building an iron bridge in Westland Township; also for building a stone pier

to the Guernsey bridge near Cambridge Township, and for the wing walls and stone abutments to the Amspoker bridge in Westland Township.

CARTHAGE, MO.—Bids will soon be asked by the County Court to build a steel bridge 80 ft. long and 24 ft. wide over Turkey Creek near Joplin.

CHATTANOOGA, TENN.—Plans have been made for building a steel bridge over the tracks at Eleventh street to cost about $12,000. R. Hooke is City Engineer.

CHICAGO, ILL.—Bids are wanted July 13 by the Board of Trustees of the Sanitary District of Chicago for building the superstructure of the bridge over the Chicago River at 22nd street. The plans call for a Scherzer rolling lift bridge. Zina R. Carter is President of the Board of Trustees.

CLEVELAND, OHIO.—Bids are wanted June 1 by the Board of Commissioners of Cuyahoga County for building the steel superstructure of a bridge on the road between Brecksville and Royalton. Julius E. Dorn, Clerk.

COLONA STATION, ILL.—Bids are wanted May 30 at the U. S. Engineer office, 1637 Indiana avenue, Chicago, for the superstructure of a single-track railroad bridge over the Illinois and Mississippi Canal. C. S. Riche is Captain of the Engineers.

COLUMBUS, OHIO.—The County Commissioners, it is reported, will build a viaduct over the Pennsylvania tracks at Reed avenue.

CRAWFORDSVILLE, IND.—The Northwestern Traction Co. has petitioned the city to build a new bridge over the tracks at White street.

DARBY, PA.—Viewers have been appointed to determine whether a new bridge should be built over the creek at Chester and Springfield avenues to replace the present structure.

DES MOINES, IOWA.—A committee will report on the question of building two additional spans to the Sixth avenue bridge, which will probably be authorized by the City Council at a cost of $40,000.

ERIE, PA.—The Grand Jury has been petitioned by Greene and Harbor Creek Townships to build an iron bridge 350 ft. long over Four Mile Creek at Kane.

EVANSVILLE, IND.—Bids are wanted June 7 by the County Commissioners for building about ten bridges in Vanderburg County.

EVERETT, WASH.—The City Council is considering the question of making repairs to the present bridge over Snohomish river at about $10,000 instead of building a new structure.

FRANKLIN, PA.—Bids are wanted May 27 by P. K. Smiley, Clerk of Venango County, for building the steel superstructure of a bridge 135 ft. long with 16-ft. roadway over Sugarcreek in Jackson Township at a place known as Shaw's Bridge.

GETTYSBURG, PA.—Bids are wanted June 1 by the Board of County Commissioners for building a bridge in Liberty Township; also one in Highland Township. C. W. Beaks is Clerk.

GLENDON, PA.—The Lehigh Coal & Navigation Co., the Lehigh Valley R. R. and the Borough Council are planning to build an iron bridge over the canal.

GRANT, MICH.—Bids are wanted June 2 by Thomas Cronan, Commissioner of Highways, for building a steel bridge 130 ft. long over the Black river.

HOBOKEN, N. J.—The road committee of the Board of Freeholders has agreed upon the preliminary plans for the viaduct to connect Hoboken with Jersey City Heights, which is proposed to be built in the form of a W to have three termini on the hill. Each leg is to have double electric railroad tracks and sidewalks.

HOUSTON, TEXAS.—The County Commissioners have been petitioned by residents to build a bridge at the foot of Main or Travis streets.

INDIANAPOLIS, IND.—The County Council, on May 10, unanimously voted to issue bonds for $842,000 for bridge purposes, $663,000 of which will be used for building the four bridges over the White River at Emericksville, Michigan street, River avenue and Morris street. The balance of the proceeds of the bonds will be used for new bridges and repairs to others in Center, Washington, Lawrence, Warren, Franklin, Perry, Decatur, Wayne and Pike townships.

LAWTON, OKLA. T.—Bids are wanted June 9 by the Engineer U. S. Geological Survey for building 26 steel highway bridges in Comanche County and five in Caddo County, Okla. T.

LEHIGHTON, PA.—A bridge is proposed to be built over the Lehigh River and the railroad tracks to connect Lehighton with Franklin Township, to cost about $75,000.

LETHBRIDGE, N. W. T.—A steel bridge may be built over the Belly river at this place.

MEMPHIS, TENN.—It is reported that City Engineer J. A. Omberg, Jr., says that the M'Lemore avenue viaduct, which is to be 700 ft. long and 42 ft. wide, to cost about $60,000, will be built this year.

NEWCASTLE, IND.—Bids are wanted May 27 by the County Commissioners for building a number of bridges and arches and repairs to two bridges in Henry County. J. M. Bundy is County Auditor.

PITTSTON, PA.—The Delaware & Hudson, it is reported, will build a bridge 861 ft. long over Plymouth River.

ST. CATHARINES, ONT.—The new steel bridge to be built at Queenston street will cost in the neighborhood of $15,000.

ST. JACOBS, ONT.—Bids are being received by John L. Wideman, Clerk of the Township of Woolwich, for a bridge 310 ft. long, 18 ft. wide, to be built over the Grand River at Conestogo.

ST. PAUL, MINN.—The Northern Pacific has submitted plans to the City Engineer for a new steel arch bridge with two central spans resting on concrete abutments to be built over its tracks at Fauquier street.

SANDWICH, ONT.—Bids are wanted June 7, by J. F. Mellen, County Clerk, for building four single-span steel bridges over Bell River.

SCRANTON, PA.—Bids are being asked for building bridges at Sanderson avenue, Albright avenue and over Keyser creek at Luzerne street. The city has sold bonds to the amount of $60,000 to pay for this work.

SEATTLE, WASH.—The Seattle Electric Co. has agreed to build over or under bridges wherever its lines cross the railroad tracks in the city. Such crossings occur at several points.

SODUS, N. Y.—The State will appropriate an additional $4,000 for the bridge over Great Sodus Bay, making the total $9,000, and work is to be begun at once.

SPRINGFIELD, OHIO.—Bids are wanted June 8 by the Board of County Commissioners of Clark County for building a single-track bridge 178 ft. long with 18-ft. roadway over Mad River in German Township; also for a single-track bridge 97 ft. long with 16-ft. roadway over Honey Creek in Bethel Township. A. K. Hahn is Auditor.

SUNBURY, PA.—A bridge is to be built over the Little Shamokin Creek.

TAYLOR, TEXAS.—It will cost about $10,000 to replace the bridges recently destroyed by floods in Williamson County.

TOLEDO, OHIO.—Bids are wanted May 30 by the Board of Public Service for rebuilding the westerly end of Fassett street bridge to consist of three deck spans 124 ft. each with 24-ft. roadway and 6-ft. sidewalks, and three concrete piers. F. I. Consaul is City Engineer.

TORONTO JUNCTION, ONT.—The Canadian Pacific will build a new steel bridge over Black Creek at Mount Dennis, to cost about $25,000.

TYNDALL, S. DAK.—Bids are wanted May 24 by the Auditor of Bonhomme County for building all the bridges that may be needed during the year.

UTICA, N. Y.—This city and Marcy are to build a bridge over the Mohawk River at Schuyler street to cost $700,000.

WASHINGTON, D. C.—Work is to be commenced July 1 on the Anacostia bridge, for which funds are available on that date for $100,000. The commissioners are authorized to contract for the whole work, to cost about $250,000.

WEATHERFORD, OKLA. T.—The Colorado, Oklahoma & Southeastern will build a trestle 3,000 ft. long over the South Canadian River on the line of its proposed road between Weatherford and Woodward at a point near Putnam.

WESTBROOK, ME.—Residents are agitating the question of building a steel bridge to cost about $6,000.

ZELIENOPLE, PA.—A bridge is to built by the State over the Conoquenessing to cost about $25,000.

Other Structures.

ALLEGHENY, PA.—Heyl & Patterson, of Philadelphia, makers of coal tipples, car hauls and special machinery, will build an extension to their works to cost about $40,000.

ATLANTA, GA.—The Fulton Foundry & Machine Shops, during the summer, will put up two brick and steel buildings 120 ft. x 300 ft. each, also some other buildings, and will require some new equipment.

BATON ROUGE, LA.—The Yazoo & Mississippi Valley has reached an agreement with the city authorities to build a brick passenger station at the foot of North Boulevard street.

BURLINGTON, N. J.—The Thomas Devlin Manufacturing Co., of Philadelphia, maker of malleable iron and soft gray iron, brass and steel castings, is considering the building of a galvanized plant at its works in Burlington.

CANTON, OHIO.—The Board of Trade and citizens are trying to raise $12,000 to buy land for shops of the Wheeling & Lake Erie.

CRESTLINE, OHIO.—It is reported that the Pennsylvania will build a roundhouse with about 46 stalls.

ELIZABETH, N. J.—The A. & F. Brown Co. is planning to build an addition to its machine shops on Third street during the summer, to cost about $40,000.

GRAND RAPIDS, MICH.—The Grand Trunk, it is reported, will build a new passenger station at Bridge street.

LOUISVILLE, KY.—The Louisville Railway Co. is planning to build a large station on Jefferson street.

MARSHALL, TEXAS.—The Texas & Pacific, it is reported, is rebuilding on a larger scale its boiler shop recently destroyed by fire.

MIDDLETOWN, CONN.—A new freight house and other improvements, to cost about $60,000, will be put in by the New York, New Haven & Hartford as soon as the consent of the city is obtained to close a portion of Williams street.

MILWAUKEE, WIS.—The Milwaukee Street Railway Co. is planning an addition to its machine shops on Commerce street.

The American Steam Motor Co. will build a factory to cost $25,000 at Jackson and Huron streets.

NAVARRE, OHIO.—The Wheeling & Lake Erie, it is reported, will build machine shops near this place.

NEW RICHMOND, OHIO.—The Columbia Foundry Co. will start its works during the summer and put up a new foundry 80 x 125 ft. as an addition to its works.

NEW YORK, N. Y.—The proposed terminal improvements at the Manhattan end of the Brooklyn bridge, as approved by Bridge Commissioner Best, have come before the Board of Estimate and Apportionment and that body has adopted a resolution authorizing the condemnation of the necessary land between Park Row and Duane street, which is taken to indicate the approval of the general scheme of improvement.

NORFOLK, VA.—The Chesapeake Transit Co. has increased its capital $500,000 and will build car barns, sheds, a freight station and make other improvements.

OWEGO, N. Y.—The Delaware, Lackawanna & Western, it is reported, is planning to build a new passenger station here to cost $15,000; also one at Waverly to cost $10,000.

PHILADELPHIA, PA.—The Union Traction Co. is making plans to begin work on a power house and car barns for the Market street line at a cost of about $30,000.

Mayor Weaver has signed the ordinance closing Filbert street from 20th to 21st streets and authorizing the sale of property on Filbert street to the Pennsylvania Railroad for the extension of its Broad street station, on which work will be begun at once. The improvements include the widening of the roadbed between 20th and 21st streets, the widening of the present passenger lobby at Broad street and the extension of the trainshed westward to 17th street.

POQUONNOCK, CONN.—The New York, New Haven & Hartford has given a contract to Horton & Hemingway, of Providence, R. I., for a 12-stall roundhouse of brick to cost about $60,000.

RICHMOND, VA.—The Richmond, Fredericksburg & Potomac will build during the present year, a paint shop 70 ft. x 144 ft., a planing mill 70 x 120 ft., and an engine house with 10 stalls, all of which will be of brick. Contracts for the work have been let.

SEATTLE, WASH.—Plans have been filed for building a union passenger station here to cost about $75,000.

SHIPPENSBURG, PA.—The Domestic Engine Company, of Hagerstown, Md., is to build new shops here, including a brick machine shop 40 x 125 ft. and a foundry 30 x 75 ft., to make gasoline engines and pumps. New machinery, consisting of milling machines, turret lathes, presses, pipe threaders, etc., will be put in.

SIOUX CITY, IOWA.—The Illinois Central has refused to renew its lease with the Union Terminal Co., and, it is reported, will build a freight house and also a passenger station during the summer.

SPRINGFIELD, MO.—The St. Louis & San Francisco, it is reported, will enlarge its machine and car shops.

YANKTON, S. DAK.—The Chicago, Milwaukee & St. Paul, it is reported, will build a passenger station to cost about $25,000, on which work will soon be commenced.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ANDERSON & SALINE RIVER.—Incorporation has been granted this company in Arkansas to build from Clio, Cleveland County, to a point in Grant County. G. W. Ritchie is interested.

ALABAMA CENTRAL.—Grading has been completed on the extension from Booth, Ala., to Autaugaville, ten miles, and track-laying is to be begun at once. Connection will be made with the Mobile & Ohio at Autaugaville. W. H. Garrett, Autaugaville, La., is Chief Engineer. (See Construction Supplement.)

ARKANSAS WESTERN.—Articles of incorporation have been filed by this company in Arkansas to build a railroad from a point in Scott County, near Waldron, southeast through Montgomery and Garland counties to Hot Springs, 65 miles. C. D. Greaves, Hot Springs, Ark.; J. B. McDonough, Fort Smith, Ark.; S. K. Duncan, Jr., Waldron, Ark., and others are interested.

ARKANSAS SOUTHERN.—The Kinser Construction Company, Parsons, Kan., has been awarded the contract for building the first nine miles of the extension from Winnfield, La., to Alexandria. The total length of the extension is 45 miles. The work is not difficult. The line will have a maximum curvature of 3½ degrees and a maximum grade of .9 per cent. G. W. Hunter, St. Louis, is President, and J. A. Knox, Ruston, La., is Chief Engineer. (See Construction Supplement.)

CANADIAN PACIFIC.—A contract has been let to Deeks & Deeks for building a subway under Main street, Winnipeg, Manitoba. The work will cost about $115,000 and the contract calls for its completion in four months. The work will include five concrete arches and eight tracks. Foley Bros., Larson & Co., who recently received the contract for grading the various extensions which this company proposes to build have sublet the contract on the Pheasant Hill branch to Jackson & McMenemy, and the contract on the Lacombe branch, 25 miles, to J. B. L. Johnston.

CHESHIRE STREET.—A contract has been let to Ley Brothers, Springfield, Mass., for building a line from Waterbury, Conn., to Cheshire. The work includes the excavation of 160,000 cu. yds. of earth, 30,000 cu. yds. of rock excavation, 2,500 yds. of concrete masonry and 2,500 yds. of rubble masonry.

CHICAGO & NORTHERN INDIANA (ELECTRIC).—Incorporation has been granted this company in Indiana to build an electric railroad from Chicago to Indianapolis, passing through the counties of Lake, Porter, Jasper, Pulaski, White, Howard, Tipton, Hamilton and Marion. Lester Soule, Indianapolis, is said to be interested.

COLORADO & NORTHWESTERN.—Articles of incorporation have been filed by this company in Colorado. The company has been formed to operate the lines of the Colorado & Northwestern which were sold under foreclosure on May 11. S. B. Dick, who bought the road at the foreclosure sale, is a director of the new company, as are also W. B. Hayes, R. H. Whiteley and C. H. Wise, of Boulder, Colo.

COLORADO, OKLAHOMA & SOUTHEASTERN.—An officer writes that the proposed route of this road is from Weatherford, Okla. T., through Independence, Putnam, Lenora, Mutual, Hackberry and Detroit to Woodward, 90 miles, with a branch line from Hackberry to Gage, Okla. T., 35 miles. Location surveys have just been completed and contracts for grading will shortly be let. The work will include several trestles. The maximum grade is .8 per cent. P. A. McCarthy, Weatherford, Okla. T., is Chief Engineer. (April 29, p. 336).

COTTON BELT & NORTHERN.—A charter has been granted this company to build from Freco, in Ouachita County, Ark., southeast to Locust Bayou, in Calhoun County, 15 miles. H. H. Jackson, J. W. Campbell, L. O. Jackson and others are incorporators.

CUMBERLAND VALLEY.—It is reported that the company will double track the road from Martinsburg, W. Va., to Shippensburg, 53 miles. The work will be done by the company's forces.

GILPIN & CLEAR CREEK.—An officer writes that contracts for building this line will be let in about 60 days. The proposed route is from a point near Central City, Colo., northeast to Pactolus, 26 miles. The work is heavy, with maximum grades of 3 per cent. and a maximum curvature of 16 degrees. Surveys are now in progress by the Hall Construction Co. H. R. Carpenter, Central City, is Chief Engineer. (April 22, p. 314.)

GREAT FALLS & OLD DOMINION.—Press reports state that this company is about to let a contract for grading

the second half of its line to Great Falls, viz., the portion beyond the Lewinsville pike. The first half of the work, consisting of seven miles, from the Virginia end of the Aqueduct bridge across the Potomac River at Washington, D. C., is under contract to W. J. Oliver, Knoxville, Tenn. It is stated that this part of the line will be completed before the end of July. (Oct. 8, p. 282.)

Gulf & Northwestern.—This company has filed its charter with the Secretary of State in Texas. The proposed route is from Waco northwest to Palo Pinto, 100 miles, passing through McLennan, Bosque, Hamilton, Hill, Comanche and other counties. The headquarters of the company will be at Meridian, Tex. W. M. Knight, E. B. Robertson, H. S. Hale, J. E. Turner, of Meridian, are interested. (March 25, p. 248.)

Harrison Central.—This company has been chartered in Arkansas to build a railroad from Harrison northeast to a point on the White River branch of the St. Louis, Iron Mountain & Southern near Keener, 10 miles. H. W. Hodepp, J. A. Bunch and others, of Harrison, Ark., are incorporators.

Hoxie, Strawberry River Valley & Western.—A charter has been granted this company in Arkansas to build a railroad from Hoxie to Franklin, in Izard County, 50 miles. The authorized capital is $1,000,000. J. H. Stump, R. S. Thomas, O. N. Rosenburg, W. A. Chapman and others are incorporators.

Illinois Central.—The contract has been let to the Walsh Construction Co., Rock Island, Ill., for building the approach to the new Tennessee River bridge at Gilbertsville, Ky. The work requires the removal of about 350,000 cu. yds. of rock and earth excavation.

Kearney & Sheridan.—A charter has been granted this company to build a railroad from Kearney, Jefferson County, Ark., southwest to a point in Grant County, 15 miles. J. B. York, J. W. Rutherford and others, of Kearney, Ark., are incorporators.

Kendall & Sulphur Springs.—A charter has been granted this company in Arkansas to build a railroad from a point in Cleveland County northeast to a point near Sulphur Springs, Jefferson County, with a branch northwest to Darysaw, in Grant County. W. E. Graham, M. F. Dail, N. T. White and others, of Kendall, Ark., are interested.

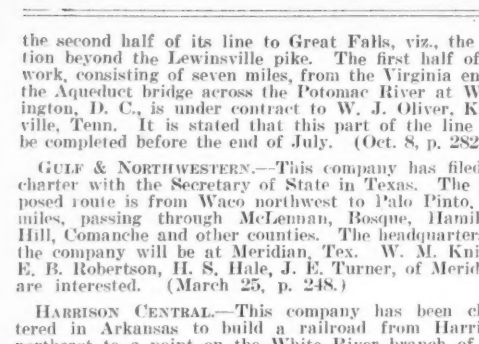
Kentucky Roads.—The newspapers say that a company is about to be organized to build a railroad 200 miles long from Newport, Ky., through Alexandria, Mount Olivet, Carlyle, Frenchburg, West Liberty and Prestonburg to Pikesville. W. H. Sloan, Cincinnati, Ohio, is said to be behind the project.

Louisiana East and West.—Surveys are reported in progress for this proposed road from Hesmer to Eunice, La., 51 miles, passing through Bunkie, Black Lake, Ville Platte and Mamon. Contracts for grading this line will be let in June. W. D. Haas, Bunkie, La., is President. (April 1, p. 264.)

Mexican Roads.—The Mexican Government has granted a concession to J. A. Naugle, of Guaymas, Mex., to build 300 miles of railroad in Lower California. The concession was obtained by Mr. Naugle on behalf of E. H. Harriman and associates, and it requires the road to be completed within six years. This line will be an extension of the Imperial branch of the Southern Pacific which now runs from Old Beach, Cal., to Calexico, 40 miles. It is stated that work will be begun at once.

The Mitchell Mining Company is said to be arranging plans to build a standard gage railroad from its copper mines at LaDicha to the port of Acapulco, 40 miles.

Midland Valley.—An officer writes that this company has let a contract for grading its extension from Muskogee, Ind. T., northwest to Tulsa, 60 miles, to R. Kinkaid and Maney Bros., of Oklahoma City. Contracts



for bridges and masonry work have been let to Kahmann & McMurray, Kansas City, Mo., and contracts for building, etc., to G. W. Donaghey, Conway, Ark. The greater part of the work is light, with a maximum grade of 6 per cent. and a maximum curvature of 4 deg. There will be ten steel bridges, including one across the Arkansas River near Tulsa, which will be 1,600 ft. long. The company recently completed its line from Bokoshe northwest to Muskogee. Connection will be made with the St. Louis & San Francisco at Tulsa and with the Missouri, Kansas & Texas and the Ozark & Cherokee Central at Muskogee. F. A. Molitor, Fort Smith, Ark., is Chief Engineer and General Manager. (April 22, p. 314.)

Morristown & Erie.—This road has been finished between Essex Falls, N. J., and Morristown. The line is about 12 miles long and passes through the towns of Essex Falls, Hanover, Hanover Neck, Whippany, Troy, Pine Brook and Morristown. The time from Morristown to New York by the new route will be about the same as that of the Lackawanna until the tunnel is completed on the line from Verona to Montclair, when it is said, it can be reduced about twenty minutes.

National of Mexico.—William Scott, who has the contract for building the Matamoros branch, reports that the road will be completed as far as San Miguel by July 1. At San Miguel, connection will be made with a narrow-gage road, owned by the National of Mexico, which runs from that place to Matamoros. This road is now being reconstructed and its gage changed to standard. Grading has been completed from Monterey to a point near San Juan. About 30 miles of track have been laid, and connection will be established between this branch and the St. Louis, Brownsville & Mexico by a ferry across the Rio Grande at Matamoros. (April 15, p. 298.)

Pennsylvania.—Contractors have begun work upon the headings of the tunnel on both sides of the Hudson River (New York). On the New Jersey side the shaft is 75 ft. deep.

Perla Northern.—A charter has been granted this company in Arkansas to build a railroad from Perla to Whittington, in Garland County, 23 miles. A. Straus, R. W. Griswell, C. L. Briant, C. A. Figley and others are interested.

St. Louis, Brownsville & Mexico.—It is reported that surveys are about to be begun for an extension of this road from Sinton, Texas, northeast to Columbia, 150 miles. An agreement has been entered into with the International & Great Northern to use the latter's tracks from Columbia to Houston. The main line from Robstown to Brownsville, 141 miles, is now practically finished. F. G. Jonah, Corpus Christi, Tex., is Chief Engineer. (April 8, p. 282.)

South McAlester, Red River & Gulf.—An officer writes that the proposed route of this road is from South McAlester, Ind. T., through Blanco to Roswell, 80 miles. The main object of building the road is to open up the new coal and asphalt deposits near the Red River and to penetrate an extensive pine timber region in the southeastern portion of the Choctaw Reserve. Negotiations are now under way with the other railroad corporations in that vicinity for beginning construction work in conjunction with them. If these negotiations fail, the incorporators intend to take charge of the road themselves and will build the 80 miles mentioned above. F. H. Kellogg, South McAlester, Ind. T., may be addressed. (May 6, p. 354.)

Temiskaming & Northern Ontario.—Bids will be received by this company until May 27 for grading the first 30 miles of the extension from New Liskeard north to a connection with the projected Grand Trunk Pacific. The line which this company is building from North Bay to New Liskeard has been graded for a distance of 95 miles and track has been laid on 57 miles. It is stated that this line will be completed to New Liskeard by the middle of September. W. B. Russell is Chief Engineer. (May 6, p. 354.)

Thornton & Alexandria.—This company has been chartered in Arkansas to build from Thornton in a southeasterly direction wholly within Calhoun County. C. W. Green and H. C. Black, of Thornton, Ark., are interested.

West Michigan Interurban.—Incorporation has been granted this company in Michigan with a capital stock of $1,000,000 for the purpose of building an electric railroad from Grand Rapids to Park, in Oceana County, via Muskegon. E. H. Cross, Grand Rapids, is Chief Engineer. F. A. Nims, Muskegon, and J. K. Flood, Hart, Mich., are incorporators.

GENERAL RAILROAD NEWS.

Atlantic & Western.—A mortgage has been filed with the International Trust Co., of Boston, as trustee, to secure an issue of $3,000,000 5 per cent. gold bonds dated Dec. 31, 1903, and due Jan. 1, 1944. This road is projected from Sanford, N. C., east to Goldsboro, with a branch west to Newton. W. E. Edwards, Sanford, N. C., is President.

Baltimore & Ohio.—The South Pennsylvania Railroad has been sold to the Baltimore & Ohio. The road was originally projected in the interests of the Vanderbilt lines, but was never completed. The sale is the result of foreclosure proceedings brought by the Union Trust Co., of New York, for default of interest payment on the mortgage of January, 1885. The mortgage covers the franchises and property of the proposed route from Harrisburg, Pa., to Port Perry, 209 miles, with two branches. (April 29, p. 236.)

Bismarck, Washburn & Great Falls.—See Minneapolis, St. Paul & Sault Ste. Marie below.

Buffalo & Susquehanna.—The regular dividend of 1 per cent. on the preferred stock and 1¼ per cent. on the common stock has been declared by this company The former is payable June 1 and the latter July 1.

Chicago, Burlington & Quincy.—Clark, Dodge & Co., New York, and Lee, Higginson & Co., Boston, are offering at 102½ and accrued interest $5,992,000 C., B. & Q. Illinois Division 4 per cent. mortgage bonds, due in 1949. These bonds are like the 3½ Illinois Division bonds now outstanding, except as to the rate of interest. They are subject to redemption as a whole at 105 and accrued interest on and after July 1, 1929, upon six months' notice.

Chicago, Indianapolis & St. Louis Short Line.—J. P. Morgan & Co., New York, have purchased $3,000,000 first mortgage 4 per cent. bonds guaranteed principal and interest by the C. C. C. & St. L. The proceeds from the sale of the bonds will be used to reimburse the C. C. C. & St. L. for expenditures made in the building of the cut-off between Indianapolis and St. Louis and for improvement on the terminals at St. Louis.

Cincinnati Southern.—The trustees of this company have passed a resolution authorizing an issue of $500,000 3½ per cent. bonds for terminal purposes, dated July 1, 1904. The issue will be offered to the Sinking Fund Trustees, and, in the event of the refusal of that board to purchase the bonds, they will be sold in the open market.

Consolidated Railway Co.—See New York, New Haven & Hartford below.

Fairhaven & Westville.—See New York, New Haven & Hartford below.

Hudson & Manhattan.—The New York State Board of Railroad Commissioners has granted a certificate of public necessity to this company to build two single-track tunnels under the Hudson river from Church street, between Cortlandt and Fulton streets, in New York City, to Exchange place, in Jersey City. W. G. McAdoo, President of the company, is reported as saying that work on these tunnels will probably be begun before the end of 1904, and that it will take about three years to finish the undertaking. The company has bought the western part of the two blocks bounded by Church, Fulton and Cortlandt streets and Broadway for a terminal. The south tunnel on the New York side will run from the river under Pier 13 at Cortlandt street to the terminal at Church street and will there connect with the north tunnel which will run under Fulton street to Pier 14. The Hudson & Manhattan R. R. Co. was incorporated on March 21, 1903, with a capital stock of $3,000,000. The headquarters of the company are at 15 Wall street, New York.

Louisville & Nashville.—J. P. Morgan & Co. announce that the syndicate which underwrote the authorized issue of $30,000,000 four per cent. collateral trust bonds has sold $23,000,000 of the issue. Of the proceeds of these bonds, $11,000,000 was used to pay off a mortgage on the North and South Alabama, and to discharge other indebtedness. The remainder was used for betterments. It is understood that the syndicate will declare a dividend of not less than 2 per cent. and will then be dissolved.

Mexican Central.—Steps are being taken by Kuhn, Loeb & Co. and Speyer & Co. in conjunction with the Mexican Central Railway Securities Co., Ltd., to protect the interests of the bondholders of the Mexican Central. The Securities Co. owns $37,500,000 of the consolidated mortgage 4 per cent. gold bonds or a majority of the bonds now outstanding. The two firms mentioned above have consented, at the request of the Securities Co. and of holders of the income and 4 per cent. gold bonds, to protect the interests of the bondholders of all classes and to undertake, if necessary, the reorganization of the railroad and the readjustment of all its securities. The holders of all classes of bonds are requested to deposit their bonds with the Equitable Trust Co., 15 Nassau street, New York, or with Speyer Bros., 7 Lothbury street, London, under the agreement dated May 12, which has been signed by the firms mentioned above.

Minneapolis, St. Paul & Sault Ste. Marie.—A circular has been sent out announcing that this road has acquired the Bismarck, Washburn & Great Falls, which extends from Bismarck, N. Dak., to Underwood. From May 15, the B., W. & G. F. will be operated as a part of the M., St. P. & S. S. M.

New York Central & Hudson River.—The directors have authorized an issue of $50,000,000 4 per cent. 30-year gold debenture bonds, of which $30,000,000 will be issued at once. These bonds are not convertible into stock and are not subject to compulsory payment before maturity. A syndicate, headed by J. P. Morgan & Co., has underwritten the $30,000,000, and this amount is to be shortly placed on the market. This issue is a part of the issue of $150,000,000 which was authorized at a meeting of the stockholders in April, 1902. A part of the proceeds from the sale of these bonds will probably be used to pay for the terminal improvements at the Grand Central station, New York, and for the electrical equipment of the line within the limits of New York City. The company has an outstanding loan of $5,000,000 5 per cent. notes which falls due on March 1, 1905. It is reported that a part of the new issue will be used to refund these notes.

New York, New Haven & Hartford.—A meeting of the stockholders of the Fairhaven & Westville Street Ry. Co. has been called for May 20 to take action on the plan of consolidating the Fairhaven road with the Worcester & Connecticut Eastern under the name of the Consolidated Railway Co. Both companies are controlled by the N. Y., N. H. & H. President C. S. Mellen, of the New Haven, says that the consolidation is to be effected under the charter of the Worcester & Connecticut Eastern, the terms of that charter being more liberal than those of the Fairhaven Co.

Old Colony Street.—At a special meeting of the stockholders, on May 19, it was voted to issue $10,000,000 4 per cent. 50-year gold bonds. The company has now filed a petition with the Railroad Commissioners for the right to issue $1,207,500 of these bonds at once. The proceeds will be used to pay for permanent improvements and additions.

Port Angeles Pacific.—A blanket mortgage for $2,000,000 has been filed by this company with the Knickerbocker Trust Co., of New York. The road has been in the hands of a receiver for some time and is now being reorganized. It is stated that work will soon be begun on the main line from Port Angeles, Wash., to the Pacific coast, 72 miles. (April 1, p. 265.)

Rochester & Eastern.—The petition for leave to increase the capital stock from $500,000 to $1,500,000 has been granted by the New York State Railroad Commission. The new stock will be used to pay for a line from Pittsford to Fairport, and for an extension of the main line from Canandaigua to Geneva.

Southern.—This company has issued $15,000,000 of the total authorized issue of $16,000,000 five-year 5 per cent. collateral trust bonds due April 1, 1909. The interest is payable semi-annually and the bonds are redeemable at 60 days' notice at 102½ after October 1, 1906. The remaining $1,000,000 may be issued at any time after April 1, 1905. The bonds are secured by collateral of the stocks and bonds of the Southern Railway. The proceeds from the sale of the issue will be used to fund $4,000,000 collateral trust bonds of December 1, 1901, and $8,000,000 of certificates of indebtedness issued at various times since 1897 for the purchase of railroad properties.

Southern Pacific.—D. O. Mills and H. S. King, trustees, have given notice to the holders of 6 per cent. mortgage bonds of the Southern Pacific R. R. Co. of California that they have on hand $280,000 for the redemption of the bonds, and they will receive proposals at the office of D. O. Mills, New York City, up to June 14.

South Pennsylvania.—See Baltimore & Ohio above.

Wabash.—A number of the holders of the debenture "B" bonds have asked the Mercantile Trust Co. to secure an accounting of the gross and net earnings of the Wabash railroad as covered by the mortgage. The bondholders claim that no separate account has been kept by the company of the earnings covered by that particular mortgage, and they wish to determine if the earnings applicable to the payment of interest on these bonds have been properly credited. The Mercantile Trust Co. is the trustee of the mortgage which secures these bonds. No action has as yet been taken on the petition of the bondholders.

Wabash-Pittsburg Terminal Co. (Wabash).—Articles of consolidation were filed with the Secretary of State at Columbus, Ohio, on May 9, consolidating the Pittsburg, Carnegie & Western, the Cross Creek and the Pittsburg, Toledo & Western railroads under the name of the Wabash-Pittsburg Terminal Co. J. W. Patterson, Jr., President of the P. C. & W., is President of the new company.